Products finishing

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Volume 2 | SEPTEMBER, 1938 | Number 12

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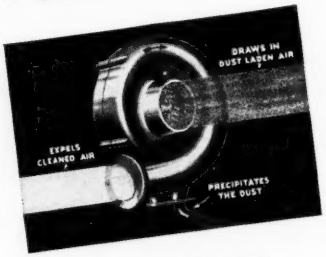

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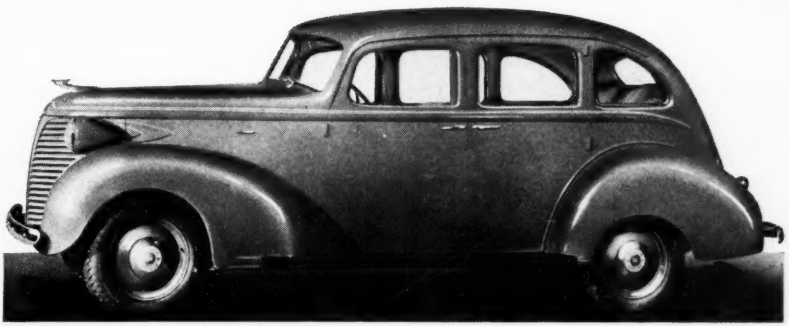

Body by Hudson

The "body beautiful" as exemplified by Hudson engineers is the subject of this treatise in which the various operations in the development of eye appeal as a sales factor are described.

By JACK HANSON

Engineer of Finishes, Hudson Motor Car Company, Detroit, Michigan

IN recent years, engineers in the automotive field have become more conscious of the fact that dependence upon styling alone to obtain the desired effect in design would be inadequate if it were not for the possibilities inherent in the intelligent use of color for accentuating contours, emphasizing streamline effects, and so on. For this reason, the Hudson engineering staff in formulating plans for the new "112" decided to incorporate color with design and thus develop a product that would have, in addition to excellent mechanical performance, the very important sales

Fig. 1 — The Hudson body, at the beginning of the finishing line, is washed with solvents that remove accumulations of oils and drawing compounds.

factor — the appeal of a beautiful body. The following article tells how this is achieved through a carefully laid out finishing department and the application of up-to-date methods.

The 112 bodies are conveyed from the fabrication department to the third floor of the finishing department building by means of elevators that are designed to carry the single units. To facilitate ease of handling throughout the various finishing operations, each body, as it leaves the elevator, is placed on an individual truck which is merely a framework of special design located on four cast iron rollers which fit into a double track of a floor-level conveying system. The truck, carrying the body, is pushed manually up a ramp of an inclined finishing platform, the width of which is such that cleaning, priming, spraying, and so on can be performed with the greatest ease by the operators.

Illustration Fig. 1 shows several bodies in position at the beginning of the finishing line. Before entering the hot water spray booth shown at the left, the door jambs, window ledges, and other inaccessible portions of the body are hand brushed with Sunoco spirits to remove any large accumulations of oil, such as drawing compound. The warm water spray that follows the hand brushing has the effect of warming the metal so that a spray solution of Deoxidine will work more effectively. A special booth

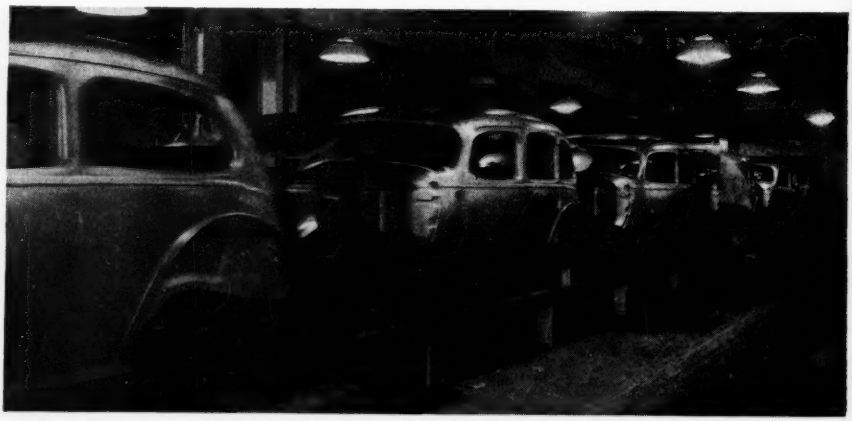

Fig. 2—Complete removal of moisture is effected by means of air under high pressure directed at the body and then passing them through a drying oven.

Fig. 3—Illustration showing a group of workers wiping the bodies with cloths saturated with alcohol.

is provided for the Deoxidine spray. The bodies, when passing through this booth, are subjected to the spray, which is directed under high pressure from a series of pipes that line the inside of the booth.

The Deoxidine spray is followed by a cold water rinse that effectively neutralizes any solution that remains. A hot water rinse is next used, and as the bodies emerge from the cabinet in which they are hot water sprayed, they are blown with air under high pressure. Fig. 2 is a view showing the bodies emerging from the hot water spray booth. The workman is going over them with an air hose to remove the entrained moisture mentioned above. In addition to the blowing procedure, the bodies are conveyed through a drying oven to insure a complete removal of moisture. This oven is 140 ft. in length and is maintained at a temperature of 215 deg. F. by means of steam coils. The average length of time required for the bodies to go through the oven will vary from 10 to 15 minutes.

Another preparatory cleaning operation is shown in Fig. 3, where a group of workers can be seen wiping

Fig. 4 — Applying a coating of flash primer in a water wash booth. Note particularly the water curtain into which excess spray is directed.

Fig. 5—Dents and scratches are marked by these inspectors. The man in the foreground is not smoking a cigarette but is holding a piece of marking chalk in his mouth.

the bodies with cloths saturated with alcohol. The alcohol dries very rapidly and leaves the surface chemically clean and ready for a coating of flash primer. The spray gun operator shown in Fig. 4 is spraying on a coating of flash primer as the body passes through a water wash spray booth of the Newcomb-David type. The operation of this type of booth is such that paint laden air drawn into the booth passes through a cleaning process and leaves the air free from paint pigments.

Built according to a water curtain principle, the booth permits the reclaiming of paint without the disadvantage of paint accumulating on the walls of the booth. A suction fan located at the rear of the booth carries the spray away from the operator but before the fume laden air is passed through the fan it is passed through a torrential water spray and then through a set of moisture eliminating plates. Freedom from dust is the result. The coating of flash primer applied in the booth just described is of the air dry type and requires but 3 minutes to set. Due to the excellent binding qualities of this primer, good adhesion for succeeding coats of lacquer is provided.

The surface undercoat is usually a light color so that it can be used as a sanding guide when sanding is necessary. The second coating of surfacer, which is dark red in color, requires an

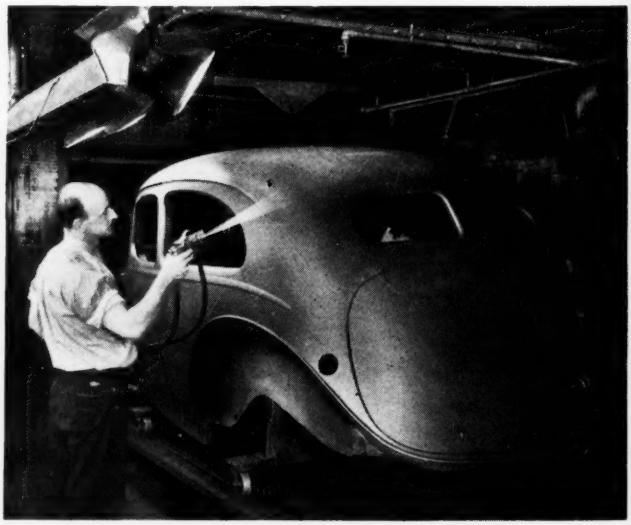

Fig. 6 — A sufficient amount of illumination is provided this spray gun operator by means of the spotlights located at the top of the booths.

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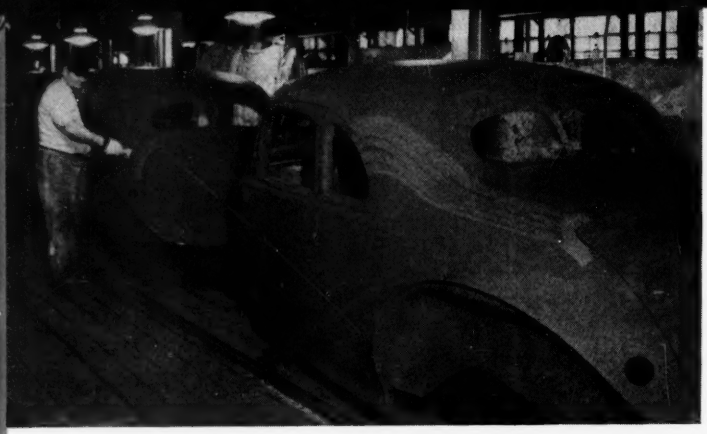

Fig. 7—Putty glazing fills unavoidable minute pits which are the result of welding the all-steel top to the lower part of the body.

oven for baking instead of being air dried like the previous coating. Following the first coating of surfacer, the bodies are carefully checked for scratches, dents, and bumps by the inspectors shown in Fig. 5. Under the strong illumination of the inspector's lamp the most minute imperfection is magnified many times. The bad spots on the surface of the bodies are chalk marked for identification purposes and are then moved down the finishing line where they are carefully removed.

The second undercoat is applied by the workman in the spray booth shown in illustration Fig. 6. A battery of three large illuminating fixtures provides adequate light and a down-draft ventilating system provides plenty of fresh air at all times. The oven in which the second surface coating is baked is kept at a temperature of approximately 200 degrees. Fifty-five minutes is required for the second surface coating to thoroughly bake, gas being used to provide the heat.

Spot glazing follows the application and baking of the second surface coating. Solder pits and seam welds are smoothed out by this method. Fig. 7 shows clearly the portion of the body that requires spot glazing. The light portion of the body indicates seams where the all-steel top is welded to the lower part of the body. An ordinary putty knife is used to apply the glazing compound. When the spot glazing operation is performed, the bodies are conveyed down the finishing line to the section where they are wet sanded.

Fig. 8—Wet sanding with No. 280 sandpaper and water as a preparation for the finishing coats of lacquer.

Fig. 9—The bodies enter the spray booth shown here and are sprayed one section at a time by the four spray gun operators located in the booth.

Fig. 8 shows the part of the finishing line where the bodies are wet sanded with water and No. 280 sandpaper. Wet sanding is an essential operation inasmuch as the surface must be perfectly smooth before the finish coat is applied. After the wet sanding, the surface is flushed with water and wiped with a sponge which aids in the removal of deposits of the "cut" surfacer together with minute particles of abrasive. From the wet sanding operation the bodies are conveyed through an oven that is heated to a temperature of 200 degrees F. Moisture acquired as a result of the previous operation rapidly evaporates as the bodies pass through the oven.

Immediately following the drying, each body is individually tack ragged to remove dust. Everything is in readiness now for the first of the final finishing coats.

In illustration Fig. 9, the bodies can be seen entering the water wash spray booth at the right. Four spray gun operators are located in this booth and as each body passes through, each individual workman sprays a small portion; thus when the length of the booth has been traversed, the body emerges at the opposite end with one side completely covered with a lacquer coating. Brilliant illumination is provided by means of large explosion-proof type lamps. A booth in reverse of the one shown in Fig. 9 is located adjacent so that the opposite side of

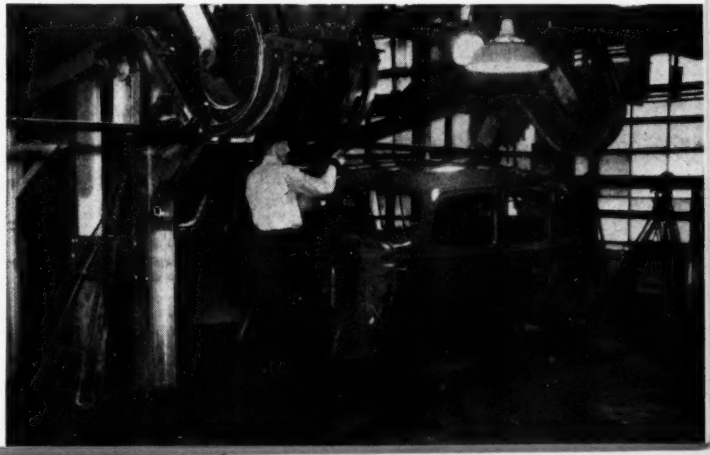

Fig. 10—At the point of the finishing line shown in this illustration, the bodies are transferred from the truck type conveyor to a bar type conveyor of the baking oven.

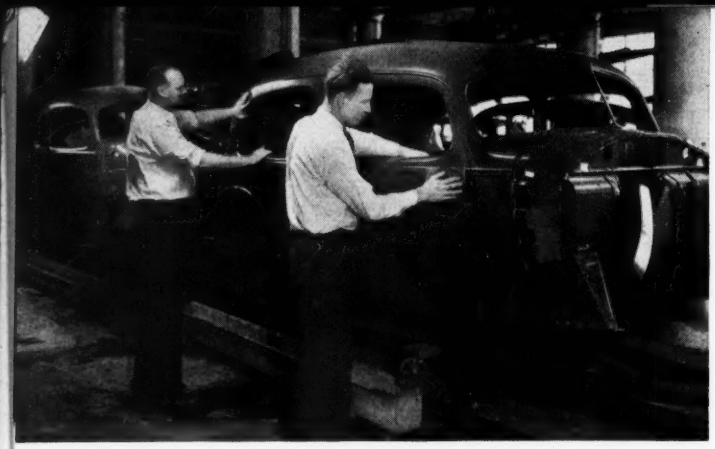

Fig. 11 — Illustration showing the wet sanding operation. The troughs in the foreground contain a solution of soap water.

the body can be immediately lacquered. A second coating of lacquer is applied approximately 5 minutes after the first without any intervening operations taking place. The third and final coating is applied and allowed to air dry for 10 minutes before being removed from the floor conveyor and transferred to an oven conveyor. The second and third coatings are applied in the same manner and in the same type of booth as the first coating.

The loading end of the oven, in which the lacquered bodies are baked for 27 minutes, is shown in Fig. 10. At this point, the bodies are transferred from the truck type conveyor that carried them through the cleaning and lacquer finishing operations to a bar type conveyor on which hooks are located for holding the bodies rigid. A Bristol temperature recording instrument attached to this oven provides the means for an easy visible check of the heat at any time during the days production. This instrument also provides a permanent daily rec-

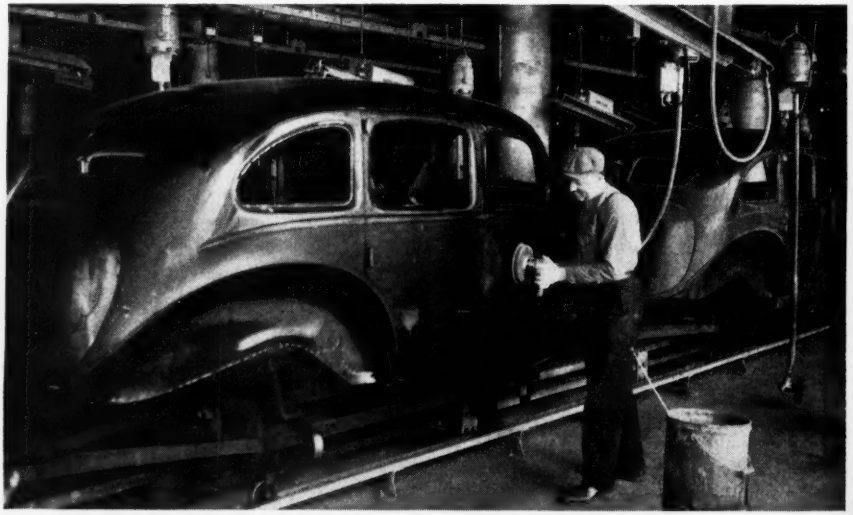

Fig. 12—Polishing the finished body is an easy task when the portable air sander shown in this illustration is used.

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ord that can be filed and used for future reference. The oven is 300 ft. long and the heat furnished through steam coils is maintained at 200 degrees.

As soon as the bodies have cooled to room temperature, after leaving the baking oven, the inside seams are covered with a waterproof sealing compound that contains a high percentage of rubber. Sealing the body by this means renders it practically 100 per cent weather proof. Application of the sealing compound is made with a flow and also a caulking gun. At this point, too, the inside surface of the rear luggage compartment is sprayed with synthetic lacquer.

The first rubbing down operation following caulking marks the beginning of the final series of finishing jobs. These jobs include rubbing down by hand, polishing, striping, and final inspection. The body is rubbed down with a soap solution and No. 320 wet sandpaper. Several workmen are shown in Fig. 11 wet sanding a body as it proceeds down the finishing line from the lacquer baking oven. Daylight illumination is obtained in this part of the finishing department by means of mercury vapor lamps. The troughs on the floor beside the tracks of the conveyor contain a soap solution that is used in the wet sanding. Rubbing down is followed by a cold water sponging rinse and then an air blow-off to remove the moisture. The body is then ready for final polishing.

Fig. 12 illustrates rather clearly the procedure followed in polishing. A preparation marketed under the trade name of Sno-Flake polish is applied on one section at a time such as the door panel, half a cowl, or the trunk lid. The polishing unit used by the operator in the illustration is driven by means of a flexible shaft operating through a cable which is attached to a portable motor located on a track above the operator. A hard felt disc pad is used with the polishing preparation at the beginning of the line but as the bodies progress down the line a softer type of disc such as a sheepskin is used. The flexible shaft units used in this department provide maximum portability and at the same time require only a minimum of space. Tack rags are again used after the final polishing to remove any trace of dust before striping.

A striper is shown in Fig. 13 applying a double stripe to a two-door sedan body. Hudson double outlet stripers are used. These stripers are arranged so that one striping nib will apply one color while the opposite nib

Fig. 13 — Illustration showing an operator using a double outlet striper. An unlimited number of color combinations is possible with this type of instrument.

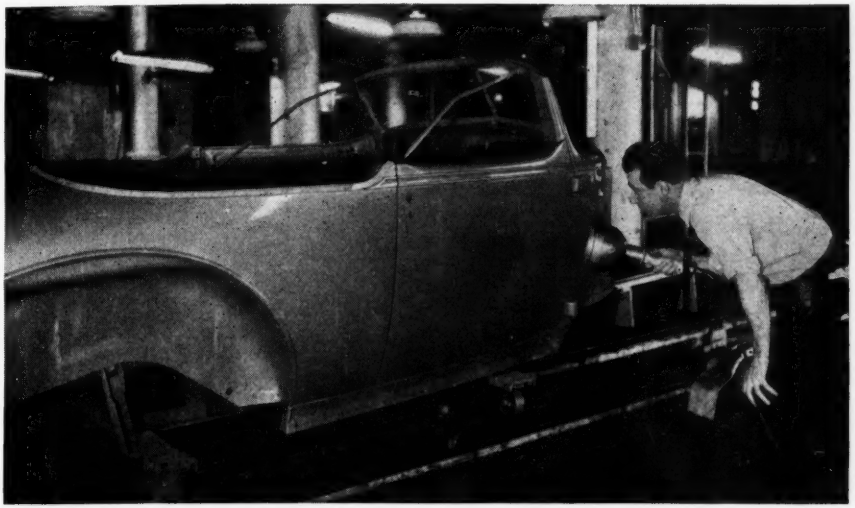

Fig. 14—The inspector shown here examines each body under brilliant illumination before placing an okeh tag on it.

applies another color at the same time. Both nibs can also be used to apply the same color when desired. A special guide fitted to follow the contour of the body molding makes the stripers easy to operate when held in the horizontal position.

The final inspection is shown in Fig. 14. At this point—the last inspection in the finishing department—the inspector uses a brilliant, diffused light, cone shaft lamp to check the finish before an okeh tag is attached. When the body passes the final inspection it is conveyed to a delivery platform and held there until an order comes through from the assembly line.

As noted at the beginning of this article, beauty of design coupled with the artistic use of color by engineers who have devoted their faculties to the acceptance and adaptation of new ideas has, in a great measure, contributed to the successful operation of the Hudson 112 finishing department.

Chromium Chemicals As Corrosion Inhibitors. The Mutual Chemical Co. of America, 270 Madison Ave., New York, N. Y., is now issuing an 8-page booklet designated as "Chromium Chemicals As Corrosion Inhibitors". This publication briefly summarizes the studies in experience in the use of chromium chemicals for the purpose of inhibiting corrosion.

The subject of why and how bichromates protect iron is very clearly and thoroughly explained in the pages of this booklet. A table of corrosion of steel is also included. Typical approved applications of corrosion inhibition through bichromates or chromates in the refrigeration, air conditioning, and chemical industries is also included. Copy free upon request.

Plast-o-Line. This is a thermoplastic tank lining material possessing unusual flexibility that is described in Data Sheet No. 652 now being issued by Heil and Company, 3082 West 106th St., Cleveland, Ohio. Plast-o-Line is said to have unusual resistance to chemicals and acids. Tests conducted in several well-known bright nickel solutions show no contamination from the Plast-o-Line lining. Copy free upon request.

Design for Plating

By Louis Weisberg

Louis Weisberg, Inc., Consulting Chemical Engineers, New York City, N. Y.

THE designer of a product seeks to obtain the best combination of functional features, appearance and style. All three factors are important, and it may be fatal to neglect any one of them. Good design goes beyond this, however, and takes into account not only how the product is going to look and work, but also how it is going to be made and finished. Modern finishing methods, moreover, play an important part in creating certain vital elements in appearance and style, as well as utility. Thus the successful designer must know some thing about these finishing methods.

Electroplating is widely used to produce attractive and durable finishes. By making use of the various metals that can be plated and by combining these with colored enamels, many novel and striking effects are obtained. So many products are plated that plating is perhaps the most widely used of all finishing methods. Consequently, the designer should certainly know something about electroplating and the possibilities it offers.

I do not mean that the designer should become familiar with all the details of plating practice. That is not necessary. But he should have a reasonably good idea of what can be done by electroplating and what can not; also what is easy to do and what is difficult.

Unless the designer knows this much about plating, and keeps in view certain things which are of the utmost importance, an endless amount of trouble may result. Most of this trouble is entirely unnecessary and can be avoided by very simple means, providing the designer understands what he is about. Those features of a design that cause the most trouble in plating are often trivial and can be modified without affecting the design seriously from the standpoint of either function or style.

Obviously what has been said about plating applies to other manufacturing and finishing operations also. However, designers are better posted, as a rule, with regard to ordinary mechanical operations than with regard to plating. Accordingly, trouble is more likely to occur in plating than in purely mechanical operations. This is without taking account of the fact that in many plants the plating departments are blamed for various defects for which it is not responsible but which are not noticed until after the article has been plated.

There are enough ways for the plating to go wrong without adding extra difficulties through faulty design. Obviously best results can be obtained by cooperation between the designer and the plater, but even this is not likely to be wholly successful unless the designer has some understanding of what the plater is up against. In any event, the designer is less likely to waste time and effort if he has some such understanding.

Those facts and principles with which the designer should be familiar are simple and easy to understand. They involve no detailed knowledge of

plating. Perhaps a majority of those occupied with design look upon plating as something mysterious and complex, and therefore make little effort to find out what they really should know about it. Some platers are to blame for encouraging this attitude, but as a general thing it can be said that the more the plater knows, and therefore the more sure he is of his job, the less likely he is to try to put an air of mystery about his work.

The purpose of this article is to try to dispel the mystery and put the subject on a straight-forward, common sense basis, so that any intelligent designer will be able to understand what he can expect of the plater and what the plater has a right to expect from him.

Success or lack of success in plating is often determined by certain things that take place long before an article reaches the plating department. First of all, good plating requires a good surface. Anything that spoils the underlying surface is an obstacle to good plating. Nicks and scratches have to be removed. Stains, tarnish or oxidized metal of any kind must be taken off, because the only surface that can be plated is one that is perfectly clean. If a piece has been soldered or welded, these operations leave scars which must be removed or covered. So a good job of plating depends first on properly preparing the surface.

Surface preparation may be either chemical or mechanical. Usually both types are required. Chemical preparation involves such operations as pickling steel or bright dipping brass. Mechanical preparation comprises polishing, buffing, coloring, tubbing, and similar operations. As a rule, pickling and bright dipping precede polishing or tubbing. The final preparation involves certain treatments, generally referred to as "cleaning", by which a chemically clean surface is produced, for it is only on such a surface that adherent, corrosion-resistant electroplate can be obtained.

If the shape of a piece is such that it can not be properly polished before plating, no amount of care in the plating department can prevent this from showing in the finished piece. Narrow places, reentrant angles, — in short, any places in which it is difficult to get a polishing wheel are bound to be poorly finished, and may therefore ruin the appearance of the whole piece. The effect on which the designer calculated may thus be entire-

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ly lost. This condition is objectionable though, not alone from the standpoint of appearance, but also because poorly polished metal makes an unsatisfactory foundation for applying an electroplate. The result may be anything from poor adherence to lack of protection against corrosion.

It is important therefore for the designer to consider whether all parts of the surface are accessible to the polishing wheel, and if not, to consider how such parts are to receive a satisfactory finish. It might seem that such considerations would eliminate nearly all intricate shapes, and, particularly, many examples of the modernistic style. This though is not the case. Frequently a minor change is sufficient to make polishing relatively easy. The important thing is to know what to look for and to realize what changes must be made before the design goes into production, when it is often too late to change, or at any rate, very costly to do so.

When it comes to such treatments as pickling, dipping, and cleaning, the first consideration is how completely can the solution drain. Does the piece have recesses or hollow parts from which the solution can not get out? If so, beware of putting it in production, for trouble will surely follow. A few years ago a certain manufacturer began making an automobile horn with a beautiful tone like that of a French horn. In fact, it was like a French horn except that it had no valves. When this horn was dipped into any of the cleaning or plating solutions, it trapped some of the solution and could be emptied only by turning it over and over. Every time a rack full of these horns was taken out of a solution, the operator went through motions that looked much like setting-up exercises before putting it into the next tank. When it is realized how essential it is to drain each solution and wash out every trace of it before preceding to the next one, it becomes evident that lack of foresight in providing for free drainage may prove very costly indeed.

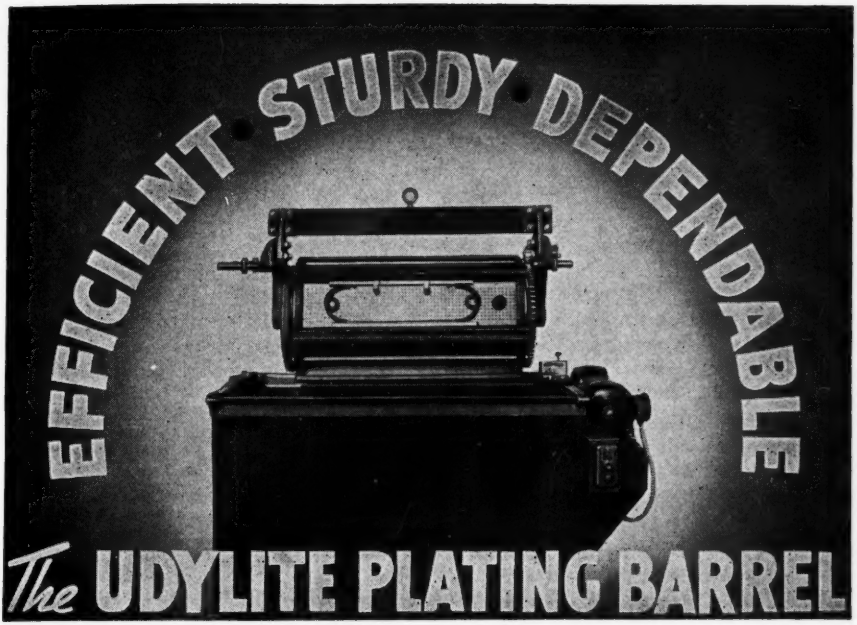
A recent experience in handling a large number of small hollow articles is illuminating. Two holes had to be drilled in the back of each of these—one at the bottom for drainage and another near the top to admit air while the solution was draining. Not until this was done could these pieces be plated and dried without showing spots where solution had slowly leaked out of the hollow portions.

Recesses and hollows may cause trouble in other ways. For example, polishing composition may become packed so hard in such places that ordinary cleaning methods fail to remove it. In many cases, polishing composition has to be picked out or brushed out on this account. Pressure spray cleaning machines may eliminate this hand labor, but these are not always available.

Another troublesome thing may happen when polishing composition becomes packed into recesses. If a solvent degreasing machine is used, the solvent dissolves the binder, leaving a residue of abrasive, which is then difficult to dislodge by ordinary means. Here again a pressure spray is most likely to be effective.

A common mistake worth mentioning in this connection is often found on pieces where the metal is turned over to form a bead. The bead is frequently closed too tight instead of leaving it open enough for the cleaning to be effective.

Numerous other examples come to mind where the absence of suitable provision for drainage has proved a source of trouble. Consider what happens in the case of a cup shaped recess from which solution can not drain out. No amount of ordinary



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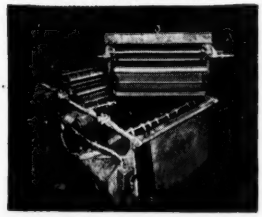

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rinsing can get all the solution out. Various forms of trouble may result. For example, soap may be carried from the cleaner tank into an acid solution, where the soap is decomposed and fatty acid liberated. Wherever the fatty matter touches,—and it quickly reaches many unexpected places because it floats on the acid solution—peeling of the deposit results. Soap carried into certain plating solutions is fatal. Another case of the same kind would be carrying cyanide into a nickel plating solution.

The point for the designer to keep in mind is that suitable openings for draining all hollow places and recesses should be provided. Provision for such drainage will insure lower plating costs and a better looking finish.

Another point on which designers are liable to go astray is in failing to consider how the piece is going to be held while it is plated. Some means of holding the piece in proper position with respect to the anodes and conducting the electric current into it are necessary. In some cases, the piece is suspended from the work bar by means of soft copper wire or by an S-shaped hook made of heavy brass or copper wire. Some pieces lend themselves to this method of suspension, but if there is no opening through which to pass the wire or no place on which to catch a hook, it may be necessary to wrap the wire around the piece. If not carefully done, this may leave a mark—and in any event, the deposit under the wire will not be as thick as that on the rest of the piece.

Suspending work on wires or hooks is not always practical, especially where large production is involved. In many plants, work is held on suitable racks or fixtures, so that one rack may carry anywhere from a few pieces to several hundred, according to the size of the piece and other conditions. Each piece may hang from a hook on the rack; often it is held in position by means of one or more springs. Little changes in design, otherwise insignificant, may facilitate holding the article in proper position. Is there a place for the hook or spring to catch?

Nearly always, there is one position with respect to the anodes that is most suitable for plating any given piece. The most important surface or surfaces are generally placed so as to face the anodes. In special instances, it may be necessary to deviate from this rule in order to insure adequate coverage in certain recesses. For it must be remembered that not all parts of an article receive equal density of current (current per unit area) or equal thickness of plate. Current distribution depends on a great many factors, including the size and shape of the tank, location of the piece in the tank and with respect to the anodes, size and shape of the piece, distance from neighboring pieces, whether or not the racks are covered with insulating material, motion of the work relative to the solution, and other things as well. Thickness of deposit at any given point depends in turn on current distribution. Holding work the right way for plating is therefore vitally important and should be considered in arriving at the final design. Some pieces are difficult to plate, simply because it is difficult to hold them the right way. These are problems for the designer as much as for the plater.

Not all plating solutions act alike when it comes to the ability to throw a deposit into the bottom of a recess. In the plater's language, they vary in throwing power. Cyanide copper, zinc, and cadmium solutions are among those that have the highest throwing power. Acid copper and nickel are quite good. Chromium is

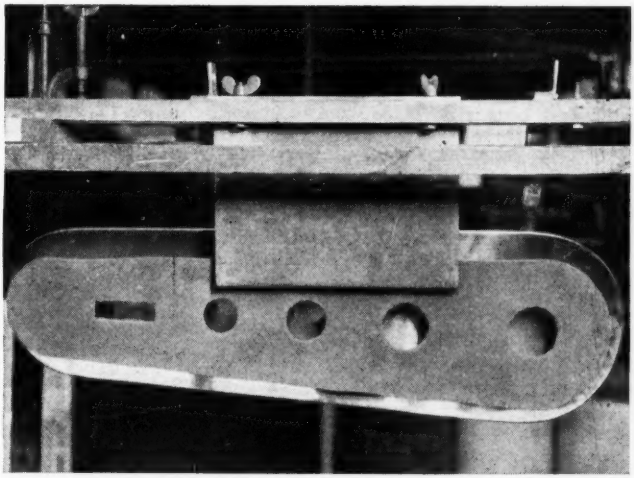
usually the solution that gives the most trouble. The difficulty with chromium is due not alone to low throwing power, but to the high current density required, which makes the problem of conducting current into the piece and getting satisfactory current distribution over the entire surface more of a problem than it is in other kinds of plating. To insure coverage in deep recesses, or on the inside of a piece, anodes are sometimes placed inside the piece, thus directing the current to those portions which would not otherwise be reached.

Chromium plating serves to illustrate another difficulty encountered with some articles. When chromium is deposited, a considerable amount of hydrogen gas is evolved at the same time. If the shape of the piece is such that the gas becomes trapped inside instead of escaping freely, the gas forces the solution away from the part of the surface and prevents it from plating there. There must be an opening near the top through which the gas can escape, or the piece should be held while it is being plated, so that there will be an opening at the top. If the opening is too small, the gas rushing out will force the solution away and leave an unplated spot or mark around the opening.

It has already been mentioned that the current distribution is not uniform and that the current density is much less on the inside of a piece than on the outside. Suppose we want to plate a piece of steel tubing. If it is to be copper plated, we must use a cyanide copper solution, because iron precipitates spongy copper from an acid copper solution. If the steel were not tubular, we might start in a cyanide copper solution and after a short while transfer to the acid copper, which gives a deposit better suited to buffing, but with tubing we can not safely make the transfer, for not enough copper goes on the inside to protect the iron from the acid copper solution.

In the same way, trouble sometimes develops in nickel solutions used for plating steel tubing. The nickel solution is acid and dissolves iron from the inside, where the current density

Plating Presser Heads



Lining up anode with workpiece to chrome plate a head for a Hoffman Pressing Machine, made by United States Hoffman Machinery Corp., Syracuse, New York. The head is of cast aluminum and the finishing procedure is as follows: etch 15 minutes in a standard chromium plating solution at 135 deg. F. 3-6-9 volts are available from 500 to 2000 amps. according to the area of the workpiece being plated. For the workpiece shown, 1300 amps. are required.

is too low to put on enough nickel to protect the steel.

This kind of trouble occurs perhaps more frequently with zinc base die castings than with any other metal. Zinc is an active metal which reacts with various plating solutions. It can not be placed in an ordinary nickel solution, unless it is first covered with a non-porous coating in some other solution. There is a special type of nickel solution for plating zinc, but this plates rather slowly and is suitable only for relatively thin coatings. For better service, zinc castings are usually plated first in cyanide copper solution and then in a warm nickel solution. A die cast nickel solution may be used in place of the cyanide copper solution.

Trouble starts chiefly in recesses. If the copper coating is too thin or porous, zinc reacts with the nickel solution, forming unsightly dark colored streaks. As a result of this action, some zinc enters the nickel solution. If this happens often enough, another kind of trouble develops, for too much zinc in the nickel solution causes a marked reduction in throwing power. The deposit in the recessed portions become thin and dark colored—in short, useless.

Die castings are being used more and more. The designer should bear in mind that zinc is especially likely to cause trouble and look out for plating difficulties. Bright nickel solutions, which have been coming into use rapidly during the last few years, show the effects of contamination even more quickly than ordinary nickel, because of the otherwise uniform mirror-like deposit they produce. A radiator ornament used on a well known car was apparently designed without regard for the difficulty of covering certain recesses; as a result, it is not being plated in bright nickel, and the plating cost is considerably higher than it would have been if the designer had thought of this problem ahead of time.

When work has to be buffed after plating, the plate is likely to be cut through at sharp edges and high spots. A little thought in advance as to how to make all parts of the surface accessible to the buffing wheel may save considerable spoilage. Cutting through after buffing is often due to carelessness, but in any event, the amount of it can be reduced by care in design.

The test of good plating is not merely what shows on the surface after it is finished. It goes beyond that to the question of how well the work stands up in service. Good service requires adequate thickness of plate at all points, freedom from porosity, and good adherence between the plate and the underlying metal. These requirements are not always easily met, at the best. To avoid adding unnecessarily to these difficulties through faulty design is a goal towards which every designer should strive. Perhaps the best way for him to succeed is to discuss every design in its formative stages with some one that has had sufficient experience in plating to point out the pitfalls to be avoided. After a little experience at cooperation of this kind, he will acquire an understanding of the things that are most likely to cause trouble in the plating room and discover various ways of avoiding these and, at the same time, accomplishing his purpose of designing an attractive and useful product.

Heil Bulletin No. 48. This bulletin describes complete acid brick lined tanks for chromium plating, muriatic and hydrofluoric acid pickling, which is now being issued by Heil and Company, 3082 West 106th St., Cleveland, Ohio. The particular advantages of these linings in electrolytic processes and in high temperature acid treatments is thoroughly explained. Copy free upon request.

"If I were an ADVERTISING MANAGER"

That's just one of the talks to be delivered anonymously by a masked speaker that will set every man thinking at the Annual Conference of National Industrial Advertisers Association in Cleveland, September 21-23. A second masked speaker will tell what he would do if he were a publication representative.

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If I were an Advertising Manager, I certainly would start now to make plans to attend the 16th N. I. A. A. Conference even if I had to hitch-hike to Cleveland. And I would send in my advance registration now to—Ed. Bossart, Bailey Meter Company, Ivanhoe Road, Cleveland, Ohio.

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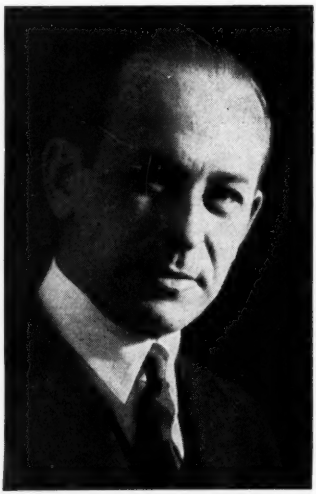
Barrel Finishing of Metal Products

Seventeenth Article of Series—Iron—Our Most Useful Metal. A method for barrel finishing cast iron parts with a resume of applicable abrasives.

By H. Leroy Beaver

IRON, our most abundant and cheapest heavy metal and the strongest and most magnetic of known substances, is perhaps also the most indispensable of all the metals. When we consider that it is conservatively estimated that upwards of forty to fifty million tons are used each year for a wider variety of applications than any other metal, it is not surprising that interest in methods of finishing parts made from this material should be paramount.



H. Leroy Beaver

To those not familiar with the versatility with which this metal may be handled, iron and steel are often regarded as two separate and distinct metals, whereas in reality they are one and the same thing and they are generally classified as "iron" or "steel" according first to carbon content and second to presence or absence of included slag. For example if iron contains very little carbon, say less than 0.30 per cent it would come within the classification of wrought iron or charcoal hearth iron, low carbon or mild steel, sometimes called ingot iron; if it contains an intermediate quantity of carbon say between 0.30 per cent and 2.2 per cent it would be classified as weld steel, puddled or blister steel, half hard and high carbon steel, sometimes called ingot steel, and the alloy steels would also come within this classification as relates to their carbon content; if it contains much carbon say from 2.2 per cent to 5 per cent it is then classified as cast iron, normal cast iron, "washed" metal, malleable cast iron or speigeleisen.

We have in our complex industrial materials production system of to-day such a wide variety of parts made from iron/steel that to undertake to

enumerate even a small proportion of objects made from this material that would be susceptible to finishing by the barrel method, would be an almost endless task. This discussion is principally in relation to methods and materials for operating on cast iron parts in revolving barrels, utilizing natural mineral abrasives covering the minerals hardness range of from 1 to 9 inclusive.

In cast iron we have a material which when fabricated into articles large and small and literally into hundreds of thousands of shapes, is operated upon in a wider range of barrel finishing equipment than any other for the operations are carried on in from the very crudest to the most highly developed metal finishing barrels. From box shaped rattlers where castings may be tumbled alone or with foundry stars either with or without an accompanying abrasive material, sand blast barrels, exhaust barrels, slatted tumblers and either wet or dry in operation, there is apparently no limit to the operations that may be carried out on iron/steel parts by the barrel process.

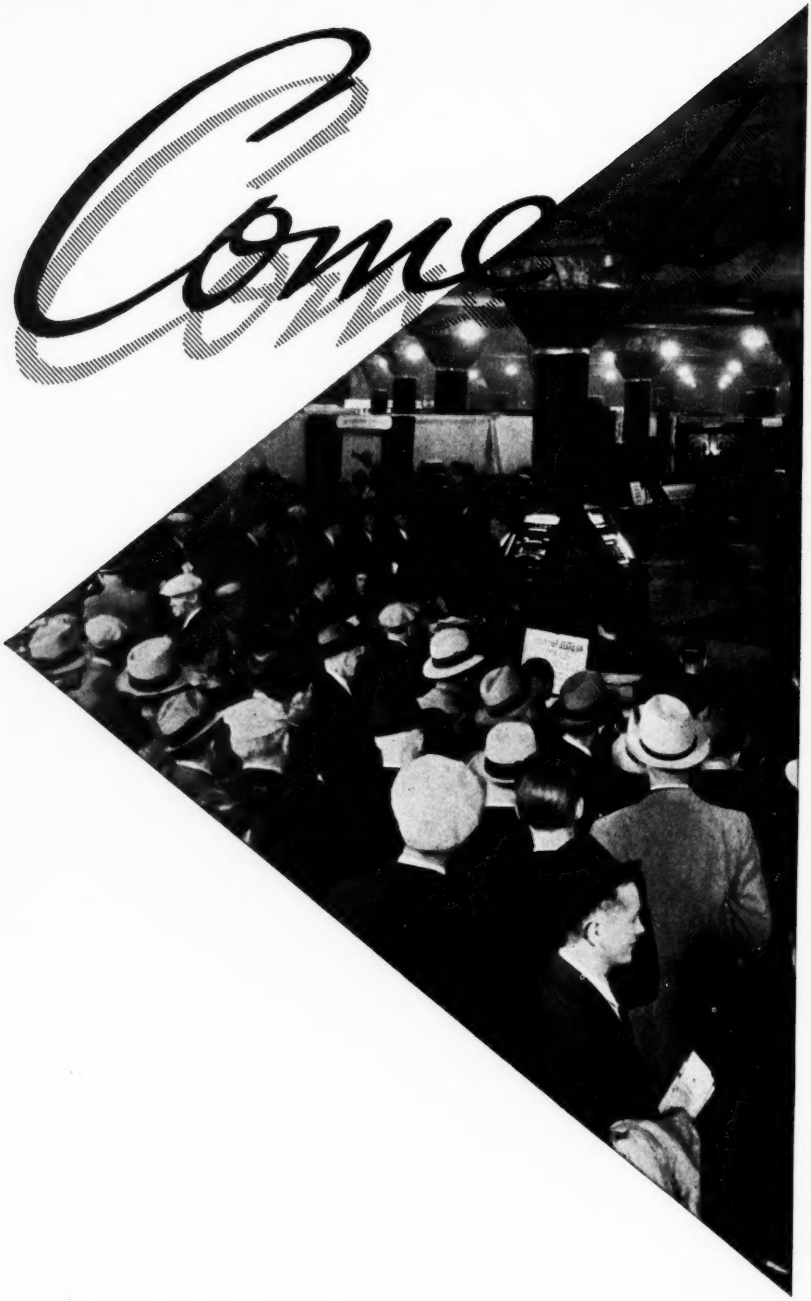
We will assume that the parts have been already processed through the foundry, that fins, gates, sprues and partings have been removed by grinding wheels of various grits or grains, so that the parts are now ready for barrel finishing preparatory to plating with some other metal, lacquering, japanning, and so on.

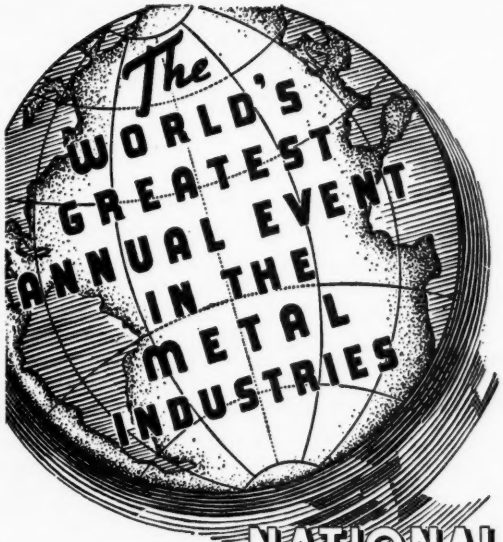
The operation of smoothing these parts by removing surface area is generally most satisfactorily carried out in either a barrel having a cast iron shell or else a barrel with sheet steel shell of proper form and design, and for the average establishment, considering the quantities handled per load, preferably in the well known high and narrow type of barrels as exemplified by the barrels of The Abbott Ball Company and The Globe Machine & Stamping Company. The reader will understand, of course, that for the quantities generally operated in the average establishments, the very large foundry equipment barrels are not applicable, and they are not contemplated in the present paper but will be made the subject of one or more papers following in this series.

We have previously discussed operations in barrels for this class of work where steel burnishing materials were used, but we are now asked to discuss the various forms of abrasives found in what we might term the "natural" mineral range and which might be considered the most applicable for this class of operations. Emery, which was previously discussed in connection with barrel finishing where soft burnishing materials were used in conjunction with emery, and which falls under the Corundum classification, with a hardness of 9 is not contemplated in connection with this paper.

Now in considering the various types of natural abrasives, we must recognize that in most cases indeed in all cases where a crystallized mineral is broken, it separates in certain definite directions along plane surfaces. This property of "cleavage" is an important essential character of minerals and especially so as it relates to those substances most adaptable to use as abrasive or polishing mediums when used in a barrel to reduce surface area and prepare parts for further processing, because it is generally understood that we can start with any abrasive mineral and in the barrel finishing operation it is broken down, that is shattered so that continuous new cutting faces or edges are presented and this shattering in a given mineral is along its normal line of cleavage. For example, calcite, with its three directions of perfect

Como





OCTOBER 17 - 21

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DECIDE NOW to join the thousands of metal men, members of five great technical societies, who will assemble in Detroit, between Oct. 17th and Oct. 21st, to bring themselves abreast of every latest development and new improvement in each phase of the Metal Industries. You will return to your desk inspired with new energy, new determination and new values to yourself and your company.

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cleavage parallel to the faces of a rhombohedron may always be readily distinguished from quartz. Hardness, or the resistance which a substance offers to being scratched by a harder substance is an important characteristic of the minerals used in barrel operation for cutting down, smoothing or polishing various metallic articles.

Back in 1920 a "Comparative Scale of Hardness" was developed by F. Mohs for the purpose of giving a numerical statement of the hardness of minerals, and which we believe might be both interesting and helpful to many readers of this series, and we therefore include it in the text as follows:

Mohs's Scale of Hardness

1. Talc
2. Gypsum
3. Calcite
4. Fluor Spar
5. Apatite
6. Orthoclase
7. Quartz
8. Topaz
9. Corundum
10. Diamond

These numerals, arbitrarily selected for standards are successively harder from talc the softest to diamond the hardest of all minerals. A piece of talc is readily scratched by gypsum; gypsum by calcite; calcite by fluor spar and so on. Hardnesses of 5 or less are generally considered as friable minerals, and by this term we mean that such minerals are easily crumbled and that they may very quickly under stress be reduced to a very fine form, and hence we distinguish this softer range as polishing minerals as distinguished from the higher numerical range which we would designate as hard cutting minerals.

So that we have for consideration the following minerals used as abrasive or polishing mediums which may be utilized either separately or combined. Slag, Pumice, Fluor Spar, Quartz, Silica, Diatomaceous Earth, Keiselguhr, Tripoli, Granite, Calcite (and Corundum), and which we will briefly describe as follows:

Slag—From iron furnaces sometimes used in barrels, is essentially a silicate of iron (ferrous silicate). It generally contains from 26 to 35 per cent of silica, 45 to 55 per cent magnesia and 5 to 10 per cent of alumina.

Pumice—A very porous froth like volcanic glass. It is igneous rock which was almost completely liquid at the moment of effusion and was so rapidly cooled that there was no time for it to crystallize. When it solidified the vapors dissolved in it were suddenly released and the whole mass swelled up into a froth which immediately consolidated. Had it cooled under more pressure it would have formed a solid glass or obsidian and this is borne out by the fact that if we take fragments of obsidian and heat them in a crucible until they fuse they will suddenly change to pumice when their dissolved gases are set free. Hence it may be understood why pumice is always found in volcanic country, or in country where volcanoes have at one time been active. The average pumice contains from 60 to 75 per cent of silica, and its average specific gravity is from 2.3 to 2.4. Perhaps the finest and most uniform known deposits of pumice as used in the arts and manufactures come from the island of Lipasi where it is mined from an extinct breached volcanic crater. Pumice is sometimes confounded with diatomaceous earth

or tripoli but it may be very easily distinguished by either microscopic or simply chemical test. It is a valuable ingredient in many metal polishes, renders a very satisfactory service in many phases of metal finishing and especially so in barrel finishing in those instances where it is used as a dry abrasive.

Fluor Spar — A natural calcium fluoride (CaF_2) and is sometimes termed Fluorite or simply Fluor. It has a hardness of 4 and it may be readily scratched with a knife blade, but it is harder than calcite. Its specific gravity is about 3.2. Variable in color, it is native to most parts of the United States. It comes within the range of soft friable polishing abrasives.

Quartz—a widely distributed mineral species consisting principally of silicon dioxide or silica (SiO_2) specific gravity 2.65 and hardness of 7. It is the commonest of minerals and is found in almost every locality. It is one of our most valuable grinding and polishing mediums and much of it in one form or another is used in making sandpaper. One of the most useful of its forms used in industry is in the manufacture of glass and porcelain where it is commonly designated as "silver sand", it being a pure quartz sand, and this variety is always especially useful in barrel finishing and especially so on what we might designate as the "White" metals. Quartz forms the large part of the bulk of sand and sandstones.

QUARTZITE is a sandstone which by the deposit of crystalline quartz between its grains has

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been compacted into solid rock. It may be distinguished from sandstone being freer from pores and when fractured presents a smooth break due to the fact that the fracture passes through the sand grains while in sandstone the fracture passes through the cementing material leaving the rounded faces of the grains exposed which gives the surface of the fracture a rough or grainy appearance. Quartzite in the form of blocks is sometimes used in tube mills or other large mills used in crushing ores, cement clinker, and so on.

Silica—is the name ordinarily given to amorphous silicon dioxide (SiO_2) and is a very widely distributed chemical compound both in its free state and in combination with metallic oxides. Free silica constitutes the greater part of sand and sandy rocks, and when fairly pure we find it in the large crystals we commonly know as quartz.

Diatomaceous Earth Keiselguhr—Tripoli—All of these are derived from fossil diatoms. These are earths generally of white, rose or gray color. Some are quite hard but for the most part they are soft and friable. While they are commercially important and of much economic value our interest in them extends only so far as they are applicable as polishing mediums for use on metals. Fossil diatoms are found all over the world and one of the largest known deposits is near Richmond, Va.—miles in extent and estimated in some places to be at least 40 feet thick.

Talc—Is a mineral which in its compact form is known as steatite or soapstone. It has a hardness of only about 1 and its specific gravity is from 2.6 to 2.8. Talc is a magnesium silicate ($H_2Mg_3Si_4O_{12}$). In color it may be white, gray, yellow and sometimes has a green cast. This represents our softest polishing medium.

Granite—is a term applied to a form of igneous rocks, deriving its name from the Latin granum—grain, and whose essential characteristics are that it is of acid composition and containing high percentages of silica, and consist principally of quartz and felspar. Popularly the term is applied to almost any crystalline rock which resembles granite in appearance or properties. The majority of granites are very coarse in grain, and their component minerals may be easily identified by the naked eye. The felspar is pearly white or pink, the quartz is usually transparent and glassy and with rough irregular fractures, while the micas appear as shining black or white flakes. Granite may be considered as one of the most interesting minerals we are discussing as it contains an average of 35 to 55 per cent of quartz, 20 to 30 per cent of felspar and 5 to 10 per cent of ferromagnesium silicates, among other things, these being the principle elements.

Calcite—is a naturally occurring Calcium Carbonate ($CaCO_3$) with a specific gravity of 1.54 and a hardness of 3. Calcium Carbonate is of exceptionally wide distribution in both the mineral and animal kingdom. It constitutes the bulk of the chalk deposits and limestone rocks, forms more than half of the mineral dolomite and the rock magnesium limestone. Most natural water contains it dissolved in carbonic acid which confers "temporary hardness" on

the water. In the animal kingdom it is most manifest in the shells of molluscs, and also in the skeletons of sponges and corals, but for our present purpose we would consider the shell of the oyster, which is an almost pure form of calcium carbonate.

While all of the elements previously enumerated are important in their bearing as abrasive or polishing mediums, our present purpose is the discussion of the finishing of cast iron parts by the barrel method, and for this we will select for discussion the two last described materials, that is, Granite and Calcium Carbonate.

We often meet with the phrase "Enduring as the Ages", as applied to Granite, but for our purpose we do not so regard it but rather as a combination of very well defined abrasives any one of which would be effective if used alone, and even more so when found in such a natural combination. Combined with the Granite we use a quite different mineral, calcium carbonate. The source of supply for both of the above for the average metal finisher is rather an unusual one in that they may be both secured from the neighborhood poultry supply dealer and at very reasonable prices, in the form of grabite grit and sterilized oyster shell grit. If the parts to be processed are small, and a small barrel is used then we would recommend the small or "chick" sizes, and on larger parts the regular sizes in both materials.

The method of use is to load the barrel to about 2/3 full, adding equal parts of the granite grit (in our experimental work we use a brand known as Stonemo, quarried in Georgia) and sterilized crushed oyster shell, and these abrasive and polishing materials should be added in such a way that they provide a substantial envelopment of the parts or a cushioning medium. Water is added until

Gold Leaf Finish

The 780 square feet of surface of this giant Phoenix, topping the 400 feet Tower of the Sun at the 1939 Golden Gate Exposition, on Treasure Island in San Francisco Bay, will be finished in gold leaf.

This huge bird is 22 feet high, weighs more than 5000 pounds and is hand-hammered from commercially pure iron made by The American Rolling Mill Company, Middletown, Ohio.

This artistic piece of metal work symbolizes the rise of San Francisco from the ashes of the 1906 earthquake and fire.

it reaches a depth of from 1 to 2 inches over the top of the entire load. Using a high and narrow type barrel the speed may be from 18 r.p.m. to 25 r.p.m. and in a long and narrow type barrel from 20 r.p.m. to 35 r. p.m. Both of these materials will progressively disintegrate in action the granite giving one cleavage after another, each cleavage presenting new cutting edges and the oyster shell will also be progressively reduced in size so that at the end of the run it will be a creamy solution. We have in this combination both a surface reducing and polishing operation. There are many light cast iron parts that could not be so treated if a steel burnishing material such as soft balls or soft shapes were used in combination with an abrasive like emery, and as described in a previous paper, and the method just above described, approximates in substance the previous operation, but with the important difference that granite grit is substituted for the soft steel balls or steel forms and calcium carbonate in the form of crushed oyster shells for the emery. Naturally with lesser weight and slower cutting abrasive the operation will require a bit longer time, but we believe the finish is superior.

The running time for the barrels varies of course with the character of the castings being finished, in which must be considered the kind and fineness of the sand in which the parts are cast and the care used in dressing the parts before the barrel operation both of which are always most important factors. The barrel should be opened at least every half hour and if additional water is required add sufficient to keep the water from 1 to 2 inches over the mass. When the desired smoothness of surface has been obtained, the parts should be taken from the barrel, rinsed with clean cold water, and dried in sawdust or fibre meal. It will be observed that the average iron casting will have a cleaner whiter appearance when finished by this method, and the surface will not be glassy smooth but will have a very fine and soft matte. Whether due to an action somewhat similar to scrubbing, this combination of materials seems to in some way clean the surface of the customary smudge of free graphitic carbon coming from the castings, and seemingly combining in some way with perhaps the fine calcium carbonate smudge as rinsed away when the parts are washed after taking them from the barrel. On completion the finish should be a prime one for the deposition of either metal coatings or lacquers.

At one time in the progress of barrel finishing development it was thought that it was absolutely necessary to add wood blocks, planer chips, sawdust, and a long line of miscellaneous impediments to combine with the abrasive materials and the parts being finished. In the light of later knowledge, we know that when the relation of specific gravity is considered, such light materials will only float on top of the mass accomplishing no useful function whatever. If castings show "pecking" or "peening" on completion of the operation, the operator may then be certain that too high a barrel speed was used and this difficulty may be readily overcome simply by reducing the speed of the barrel.

Lupomatic Polishmaster Silver Burnishing Machine

In the August Issue of Products Finishing we had hoped to illustrate all of the prominent makes of Silver Burnishing Machines in connection with the inter series on the Barrel Burnishing of Table Silverware as a maintenance proposition for the food service field. Among these was the

machine of the Lupomatic Tumbling Machine Works, 4510 Bullard Avenue, New York City, but through circumstances over which neither Mr. Lupo nor Mr. Beaver had any control the electrotype cut was not delivered on time to be included in the paper. So that those interested may have the benefit of the information on this machine, we are illustrating their Model "C" Lupomatic Polishmaster. This machine has been on the market for several years giving entire satisfaction. It is made in eight sizes to accommodate all classes of work and the installations are made either singly or in such combination as best suits the silver service of the user, or the requirements of the maintenance plater. The machines are very simple in operation, the barrel is rigid, sturdy and light, constructed of stainless steel with bronze chrome heads; the locks of a type that close efficiently and quickly, this being one of the outstanding features of the machines.

When the barrel is opened and the cover pushed back the operator has a full view of the inside of the barrel which provides for safety and simplicity in handling. The cast aluminum tube within which the burnishing barrel is operated is designed to permit the burnishing solution to remain in the tub without splashing of suds or water. The barrels have no gaskets and are so constructed that when they revolve they pick up just enough of the burnishing solution to provide for the proper lubrication of the steel burnishing materials and the silverware.

One of the principal features of the machines covers the ease with which they may be cleaned. The entire barrel unit may be quickly and readily lifted from the tub in which it is operated, by simply slipping the barrel shaft which has a square end bearing out of the frame. In this way both the tub and barrel may be cleaned inside and outside and kept scrupulously clean at all times.

These barrels are worm gear driven with the worm housing mounted to the rear of the aluminum outer tub, the

Fig. 1—Lupomatic Polishmaster Silver Burnishing Machine

motor being mounted to the rear of the gear housing, which makes for most compact construction. These machines are very quiet in operation.

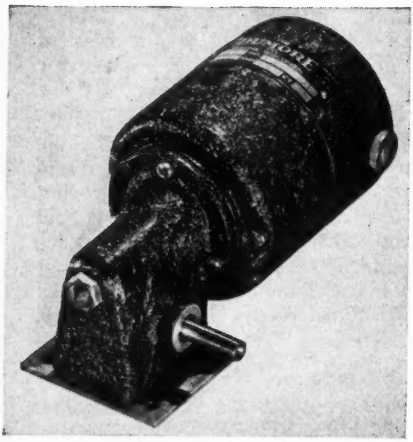
The Lupomatic Tumbling Machine Company has prepared a very interesting series of bulletins covering these machines and will be very glad to mail this series to any readers interested, if they will address them at Lupomatic Tumbling Machine Works 4510 Bullard Avenue, New York City, New York.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

FINISHES *that aid in Appearance & Utility*

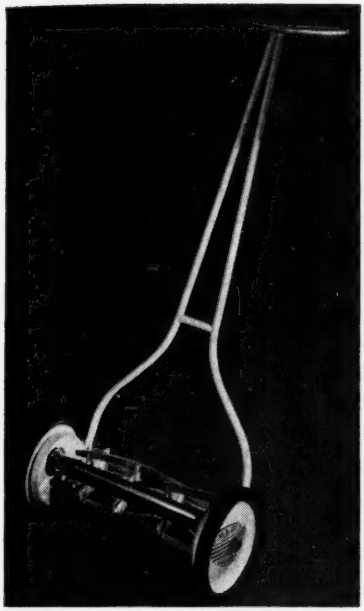
(Right)—This 1939 model auto radio is housed in an all-steel metal cabinet. The serviceable gray wrinkled finish is obtained by first copper plating the steel, which serves to shield it and at the same time provide a perfectly smooth and clean surface, and then spraying it with a specially prepared lacquer. After the application of the lacquer, the cabinet is subjected to a temperature of 250 degrees F. for fifty minutes.

(Photo courtesy RCA Manufacturing Co. Inc.)



(Left)—Illustration showing a totally enclosed fractional horsepower universal motor finished with a mar-proof crinkle enamel. This finish is beautiful in appearance and resists both abrasion and corrosion.

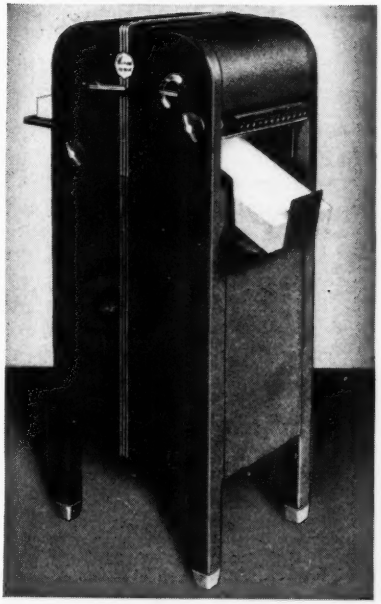
(Photo courtesy The Dumore Company)



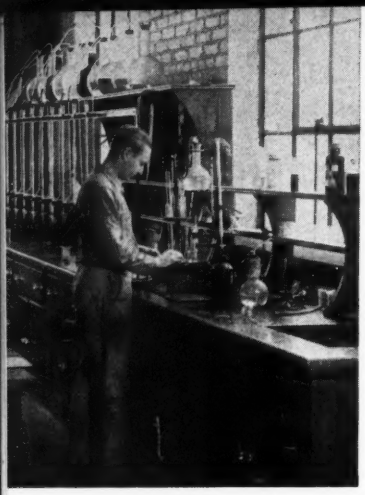
(*Photo courtesy Clemson Bros. Inc.*)

(Left)—The handle grip, tie tube, hub bolts, bed knife adjusting knob and arm, bed knife pivot bolts, roller adjusting wing bolts, clamps and brackets, and the name design on the wheels of this modern lawnmower are chromium plated. The handle, wheels, and gear housings are finished in baked yellow enamel. The bed knife, bed knife adjusting shaft and reel assembly are finished in baked silver enamel.

(Right)—A step in the direction of modernity in office equipment is the Multigraph illustrated herewith. The entire machine is enclosed in a very attractive cabinet in a black morocco crinkle enamel.



(*Photo courtesy Addressograph-Multigraph Corp.*)



the FINISHING forum

Manual of Electroplating Solution Analysis and Control

By E. A. BLOUNT

The following is the third installment of a comprehensive plating solution analysis and control procedure.

Iron Chloride Solution

A. Determination of Metallic Iron
1. Pipette a 10 cc. sample of iron solution into a 250 cc. flask.
2. Add 100 cc. of distilled water and 15 cc. of Acid Test Solution.
3. Add 3 drops of 1 per cent diphenylamine solution.
4. Titrate with .5 normal potassium dichromate until the green color of the solution changes to violet blue.
5. Cc. of .5 normal potassium dichromate used in (4) times .374 equals ounces per gallon metallic iron.

B. Determination of Free Hydrochloric Acid
1. Pipette a 25 cc. sample into a 250 cc. flask.
2. Add 50 cc. distilled water and 1 cc. of 1 per cent bromphenol blue indicator.
3. Titrate with 1.0 normal sodium hydroxide until a blue color develops.
4. Cc. 1.0 normal sodium hydroxide used in (3) times .195 equals ounces per gallon free hydrochloric acid.

C. Determination of pH
1. Use electrometric method of measuring pH.

D. Standards
1. Iron: 11.2 ounces per gallon.
2. Free hydrochloric acid: .049 to .098 ounces per gallon.
3. pH: 1.8.

Platinum Solution

A. Determination of Metallic Platinum
1. Pipette 25 cc. of platinum solution into a 250 cc. beaker.
2. Add .5 gram of granulated zinc and warm until the reaction ceases.
3. Add 25 cc. of distilled water and 10 cc. of concentrated hydrochloric acid.
4. Boil 10 minutes keeping the solution volume constant by the addition of distilled water.
5. Filter through Whatman No. 42 filter paper (or its equivalent.) and wash well.

6. Ignite the filter paper and precipitate and weigh the metallic platinum.
7. Weight of precipitated platinum in (6) times 5.36 equals ounces per gallon of metallic platinum.
8. Weight of platinum in (6) times 97.5 equals pennyweight per gallon of metallic platinum.

B. Determination of Total Ammonia
1. Pipette a 10 cc. sample of platinum solution into a 250 cc. distilling flask.
2. Add 50 cc. of 10 per cent sodium hydroxide and distill off 30-40 cc. of distillate.
3. Collect distillate in 50 cc. of .1 normal sulphuric acid.
4. Add 3 drops methyl orange indicator to distillate - and - acid mixture.
5. Titrate with .1 normal sodium hydroxide until the pink color changes to a light yellow.
6. (50.0 minus the cc. of .1 normal sodium hydroxide used in No. 5) times .0228 equals ounces per gallon total ammonia (as NH_3).
7. Ounces per gallon ammonia times 4.71 equals ounces per gallon ammonium nitrate.
8. Ounces per gallon ammonia times 3.89 equals ounces per gallon ammonium phosphate (mono-hydrogen orthophosphate).

C. Determination of Total Phosphate.
1. Pipette a 10 cc. sample of platinum solution into a 250 cc. beaker.
2. Add .5 gram of granulated zinc and boil for 15 minutes.
3. Filter through fine filter paper and wash well with distilled water.
4. Collect the filtrate and washings in a 250 beaker and add Magnesia Mixture slowly, while stirring, until the solution becomes cloudy.
5. Add 10 cc. excess Magnesia Mixture.
6. Estimate the total volume of the solution and add 25% of that volume of concentrated ammonia.
7. Stir solution for 30 minutes and filter through Whatman No. 42 filter paper or its equivalent.
8. Wash once with dilute ammonia solution.
9. Wash twice with saturated ammonium nitrate solution.
10. Ignite filter paper and precipitate in a porcelain crucible.
11. Calculate weight of precipitate in grams.
12. Grams precipitate in (11) times 11.4 equals ounces per gallon total phosphate (as PO_4)
13. Ounces per gallon phosphate (in 12) times 1.39 equals ounces per gallon ammonium phosphate (mono-hydrogen orthophosphate).

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14. Ounces per gallon phosphate (in 12) times 3.77 equals ounces per gallon sodium phosphate (dibasic orthophosphate).

D. Standards:
1. Platinum: 1.34 ounces per gallon (dinitro-diamino bath) .5 to .7 ounces per gallon (phosphate bath)
2. Total ammonia: 2.5 to 2.75 ounces per gallon (dinitro-diamino bath); 1.5 to 1.6 ounces per gallon (phosphate bath)
Ammonium nitrate: 13.4 ounces per gallon (dinitro-diamino bath)
Ammonium phosphate: 6.0 ounces per gallon (phosphate bath)
3. Total phosphate:
Ammonium phosphate: 6 ounces per gallon.
Sodium phosphate: 32 ounces per gallon.

Rhodium Solution

A. Determination of Rhodium
1. Pipette a 25 cc. sample of the rhodium solution into a 250 cc. beaker.
2. Add .5 gram granulated zinc & warm the mixture.
3. After the reaction ceases, add 10 cc. of concentrated hydrochloric acid and boil 10 minutes.
4. Cover beaker and allow to stand 24 hours.
5. Decant solution through Whatman No. 42 filter paper (or its equivalent) keeping precipitate in the beaker.
6. To the precipitate in the beaker, add 20 cc. of dilute aqua regia and warm for 30 minutes.
7. Filter through the filter paper, wash once with dilute aqua regia and twice with water.
8. Ignite the filter paper and precipitate.
9. Calculate the weight of the precipitate (in grams).
10. Weight precipitate (in 9) times 5.36 equals ounces per gallon rhodium.
11. Weight precipitate (in 9) times 97.5 equals pennyweight per gallon rhodium.

B. Determination of Total Phosphate (Phosphate Rhodium Bath)
1. Follow exactly the procedure of Method C under Platinum Solution.
2. Ounces per gallon total phosphate (PO_4) times 1.04 equals ounces per gallon phosphoric acid.

C. Determination of Sulphate (Sulphate Rhodium Bath)
1. Pipette a 5 cc. sample of rhodium solution into a 250 cc. beaker.
2. Add .25 gram granulated zinc and boil for 15 minutes, keeping solution volume constant by additions of distilled water.
3. Filter through fine filter paper and wash three times with distilled water.
4. Heat filtrate and washings to boiling and add 10 cc. of concentrated hydrochloric acid and 35 cc. of a 10 per cent barium chloride solution.
5. Allow the solution to stand 1 hour at 150 deg. F.
6. Filter through Whatman No. 42 (or its equivalent) and wash with hot water several times.
7. Ignite paper (6) and precipitate in a porcelain crucible.
8. Calculate weight of precipitate (in grams).
9. Weight precipitate (8) times 11.02 equals ounces per gallon sulphate.
10. Ounces per gallon sulphate times 1.02 equals ounces per gallon sulphuric acid.

D. Determination of pH
1. Use electrometric method—pH meter.

E. Standards

1. Rhodium: .134 to .268 ounces per gallon (sulphate bath); .268 ounces per gallon (phosphate bath)
2. Phosphoric acid: 1 to 5 ounces per gallon (phosphate bath)
3. Sulphuric Acid: .5 to 5.5 ounces per gallon (sulphate bath)
4. pH: 1.1 to 1.5 (phosphate bath) 0.5 to 1.0 (sulphate bath)

Composition of Analytical Solutions

Acid Test Solution—150 cc. concentrated sulphuric acid and 150 cc. concentrated phosphoric acid diluted to a liter with distilled water.

Ammonium Chloride—20 per cent—20 grams of C.P. ammonium chloride diluted to 100 cc. with distilled water.

Aqua Regia—Dilute—5 cc. concentrated nitric acid plus 15 cc. concentrated hydrochloric acid diluted to 100 cc. with distilled water.

Barium Chloride—10 per cent—10 grams of C.P. barium chloride per 100 cc. of water solution.

Barium Nitrate—10 per cent—10 grams of C.P. barium nitrate per 100 cc. of water solution.

Boric Acid Indicator—1 gram bromcrescol purple plus 1 gram phenolphthalein dissolved in 100 cc. of pure ethyl alcohol.

Diphenylamine—1 per cent—1 gram diphenylamine, 60 cc. of glacial acetic acid and 40 cc. distilled water.

Ferric Ammonium Sulphate—2 per cent—2 grams C.P. ferric ammonium sulphate per 100 cc. water solution.

Ferrous Sulphate—.5 normal — 139 grams C.P. ferrous sulphate per liter water solution.

Hydrochloric Acid—1.87 normal—153

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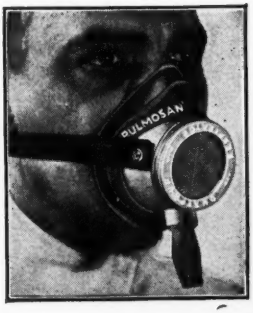

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FOR DUSTS — R-110 Respirator

Protects against fine dusts. Safe, comfortable, weighs only 2½ oz. Inexpensive filters easily changed.

cc. of C.P. concentrated hydrochloric acid per liter of water solution.

Hydrochloric Acid—1.0 normal — 81.8 cc. of acid per liter of water solution.

Methyl Orange Indicator—1 gram of methyl orange per liter of water solution.

Magnesia Mixture—Dissolve 10 grams of magnesium chloride and 26 grams of ammonium chloride in 100 cc. distilled water. Add 24 cc. of concentrated ammonium hydroxide and dilute the solution to 185 cc. with distilled water.

Oxalic Acid—.1 normal—6.3 grams per liter water solution.

Phenolphthalein Indicator—1 gram of phenolphthalein in 100 cc. of ethyl alcohol.

Potassium Dichromate—.5 normal—24.45 grams of C.P. potassium dichromate per liter water solution.

Potassium Dichromate—.658 normal—32.26 grams per liter.

Potassium Iodide—10 per cent—10 grams of C.P. potassium iodide per 100 cc. water solution.

Potassium Permanganate—.1 normal—3.16 grams C.P. potassium permanganate per liter water solution.

Silver Nitrate—.1 normal—17.0 grams C.P. silver nitrate per liter water solution.

Sodium Chromate—2 per cent — 2 grams per 100 cc. water solution.

Sodium Hydroxide—10 per cent—10 grams per 100 cc. water solution.

Sodium Hydroxide—20 per cent—20 grams per 100 cc. water solution.

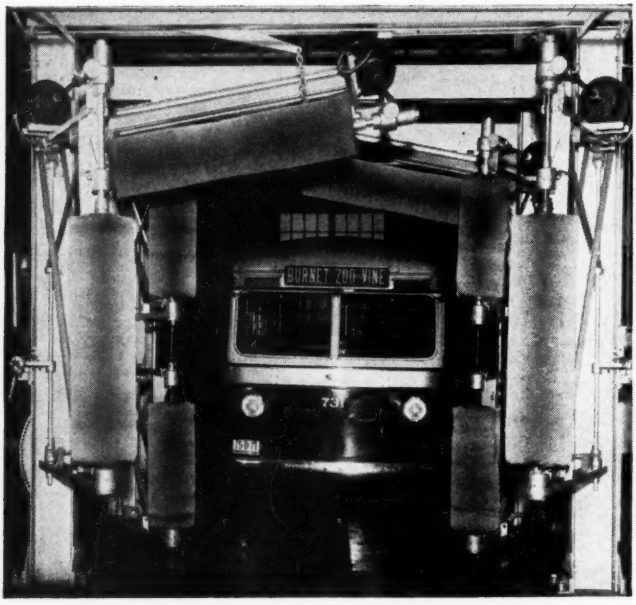
Sodium Hydroxide — .1 normal — 4 grams per liter water solution.

Sodium Hydroxide—1.0 normal—40 grams per liter water solution.

Sodium Thiosulphate—.1 normal—25 grams per liter water solution.

Sodium Thiosulphate—1/80 normal—3.1 grams per liter water solution.

Sulphuric Acid—.1 normal—2.79 cc.



Cleaning

Cleaning prior to painting can be effectively done in this machine which automatically washes the sides, windows, and roof of a bus simultaneously in 35 seconds. To wash a bus, the driver merely runs it to the front of the machine and turns on the bus headlights. This light strikes an "electric eye" and turns on the water and starts the driving motors of the six brushes. The bus is driven through the machine and when the headlights are turned off, the machine stops.

(Photo Courtesy Leeds, Tozzer & Co., Inc.)

of concentrated C.P. Sulphuric acid per liter water solution.

Sulphuric Acid—1.0 normal—27.9 cc. acid per liter.

Sulphuric Acid—1.87 normal—52.1 cc. acid per liter.

Starch Solution—1 per cent—1 gram soluble starch and .1 gram C.P. sodium hydroxide per 100 cc. water solution.

Uranium Nitrate — 5 per cent — 5 grams of uranium nitrate per 100 cc. water solution.

Sources for Test Sets and Special Equipment

All chemicals and general laboratory equipment mentioned can be purchased from any chemical supply company.

The Kocour Test Sets are distributed by the Kocour Company, Chicago, Illinois.

pH papers are imported by Paul Frank, New York City.

Colorimetric comparator sets for determining pH are distributed by Kocour, Chicago; LaMotte, Baltimore; Taylor, Baltimore; and laboratory supply companies.

Electrometric pH instruments are distributed by the Thwing-Albert Instrument Company, Philadelphia; the Coleman Electric Company, Maywood, Illinois; and the Kocour Company, Chicago.

Other test sets are distributed by E. I. du Pont, Wilmington, Delaware; Udylite Company, Detroit; and Hanson-Van Winkle-Munning, Matawan, New Jersey.

"Du Pont Chemicals, Processes, Materials and Service for Electroplating." This is the title of an 8-page catalog which is now being distributed by E. I. du Pont de Nemours & Company, Inc., Electroplating Division, Wilmington, Delaware.

In the Electroplating Chemicals Division of this catalog are described plating salts, cyanides, precious metal cyanides, acids and salts. In another division of the catalog, du Pont Electroplating Processes are clearly explained. In the Materials Section, anodes, alkalies, solvents, bright dips, brightening agents, acids, wetting agents, and lacquers are described.

The extent of the du Pont technical service for electroplaters is fully outlined. Test sets for determining the thickness of zinc, zinc metal content and the determination of cyanide are explained in the final paragraphs of the catalog.

A copy of "Du Pont Chemicals, Processes, Materials and Service for Electroplating" will be sent free upon request.

Ferro Stabilite Bulletin. In order to reduce the increased reflectance value of recoated work, the Ferro Enamel Corporation, 4150 East 56th St., Cleveland, Ohio, has placed on the market a compound that can be used as a substitute for the opacifier used in the regular milling of white enamel, to be known as "Stabilite". The amount of Stabilite required in millings of enamel for recoat work varies with the reflectance limits required in individual enameling plants.

A copy of Ferro Stabilite Bulletin will be sent free upon request.

MAGIC TACK RAGS remove specks, lint and sand particles--- bring out that deep, smooth luster, produce a faultless surface for white or colored finish. Why use "home made" tack rags when you can buy MAGIC TACK RAGS at trifling cost! They are tackier, do not dry--- are dust-proof and spontaneous combustion proof. Packed in dozen and gross lots or more. Made only by the

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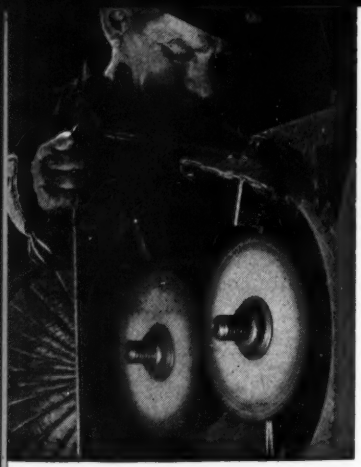


NEW *Plant equipment and* MATERIALS

Eclipse Pressure Feed Spray Unit

Eclipse Air Brush Co., Inc., 390 Park Ave., Newark, N. J., has just placed on the market a small pressure feed spray unit to be known as the "B+". This unit is available in one or two quart sizes for use with any Eclipse gun. This unit is said to fill the gap between the cup gun and the full size spray unit.

Eclipse Pressure Feed Spray Unit

The B+ Unit is said to have refinements of control such as pressure regulator, air gage, shut-off valve on air supply, Eclipse 3-way release valve and safety valve, mounted on a durable, lightweight control head. A container can be screwed directly into the control head. Four feet of air and fluid hose connect the container and gun. A T-shaped handle for easy carrying is also said to provide a means of hanging the container from belt, ladder or any convenient projection near the work.

The B+ Gun is said to spray with full efficiency in any position, including a vertical position pointing up or down. By operating the gun from the container, it is possible to reach surfaces not accessible to a cup gun. The elimination of the weight of the container and material from the work hand is said to speed up the operation and lessen fatigue.

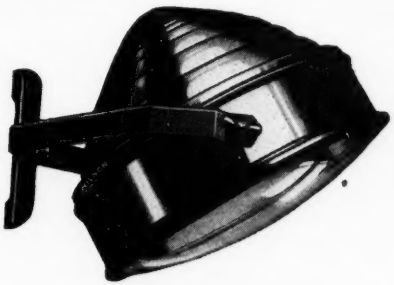
Paints and enamels can be applied successfully at pressures as low as 10 pounds and synthetics can be applied without "orange peel".

Wilson Dust-Proof Industrial Floodlight

Wilson Lighting, Inc., 411 S. Clinton St., Chicago, Ill., has recently placed on the market a new Model D-61 Dust-Tight Industrial Floodlight which is said to be especially suitable for grinding, polishing, buffing and similar operations where an open reflector quickly accumulates a coating of dirt and results in reduced lighting efficiency.

The reflector is made of solid aluminum alloy with a polished specular reflecting surface which has a high reflecting efficiency. The reflecting sur-

face is non-tarnishing and concentrates the light for close work such as is required in the inspection of polished



Wilson Dust-Proof Industrial Floodlight

surfaces and fine finishes, grinding and polishing.

The no-neck design of the floodlight increases light output by eliminating loss of light in a reflector neck and places the lamp filament at the rear instead of the front of the floodlight, thus avoiding glare. Installing a new lamp is accomplished by removing the reflector instead of the lens, thus the possibility of lens breakage is eliminated. The sealed glass lens prevents the collection of dust on the reflector or lamp bulb and thus maintains maximum lighting efficiency in dusty surroundings.

The Wilson Dust-Proof Industrial Floodlight has an adjustable trunnion mounting bracket with a cast base for attaching to any surface. The height of the unit is 13 in., depth 7 in., and diameter 10 inches. A blue tinted daylight lens for accurate color discrimination in finishes is also available.

Modine Heater

A blast heater for heating, ventilating, air conditioning, and process applications has been placed on the market by Modine Mfg. Co., Racine, Wis. An outstanding feature of this heating unit is the elimination of expansion strain. An expansion bend allows each tube to expand and contract as its temperature requires without affecting the tube adjacent to it. Headers and tubes are cylindrical, and are brazed into a single rugged unit without the use of gaskets, bolts or screw joints. All steam passages are of copper or copper alloy from

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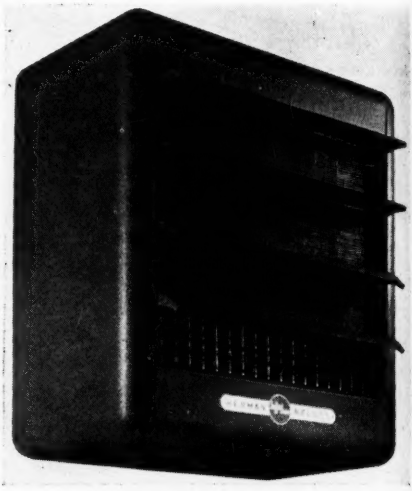
the point where the steam enters to where it leaves in the form of condensate. A steam distributing plate rations steam evenly to all tubes the full width of the condenser. The Modine Heater unit is available in a large variety of sizes and capacities, depending upon the operation involved.

Herman Nelson Propeller-Fan Unit Heater

A propeller-fan type unit heater, to be known as the "hiJet Heater," has been placed on the market by The Herman Nelson Corporation, 36th St., Moline, Illinois. The hiJet Heater can be used for steam or hot water heating of all types of industrial or commercial buildings.

The fan of the hiJet Heater is of new streamlined design with large face area and is said to combine quiet, smooth operation with an increased efficiency. The heating element is designed with loops to absorb the difference in expansion and contraction. The individual tube and loop is fabricated of red brass with no connecting joint which might weaken construction.

The tubes project from the side of the supply header above the center line, thus assuring proper distribution of steam. A patented stay tube maintains proper relationship between headers. The motors, for single, two or three speed operation, and fan assembly are mounted on steel arms designed to absorb and dissipate torsional vibration and thus prevent transmission of vibration to the cabinet. Louvers located at the front are adjustable and curved to direct the heat downward.



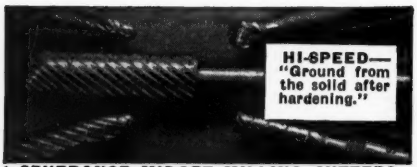
Herman Nelson Propeller-Fan Unit Heater

The grille or discharge nozzle may be used in place of the louvers. The cabinet is of attractive rounded design and is built of heavy gage sheet steel and finished in steel grey Morocco. The hanger and steam connection are located near the center of gravity for ease of installation.

The hiJet Heater is available in a complete range of 18 sizes for use with steam or hot water. Air capacities range from 275 cu. ft. per minute to 5,060 cu. ft. per minute.

Sodium Chloride Tablets and Dispenser

Industrial Products Company, 741 W. Somerset St., Philadelphia, Pa., has re-



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Large stock of Standard cutters. Any shape, any size—custom made for burring, countersinking, taper-reaming, tube burring and facing, ball socket reaming, trepanning, etc. Submit your problem to our engineers. CATALOGUE ON REQUEST
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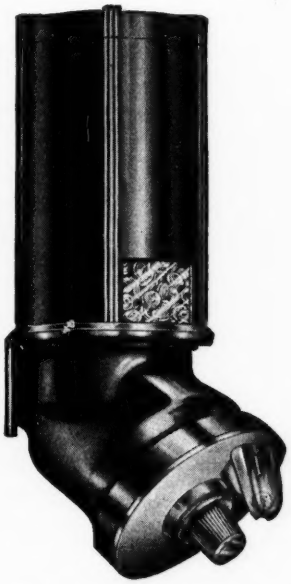
Strictly first quality aluminum oxide abrasive grain manufactured in our own electric furnace plant. Specially prepared and treated for most efficient polishing performance. Write for samples.
ABRASIVE COMPANY GRINDING WHEEL AND ABRASIVE DIVISION OF SIMONDS SAW AND STEEL CO PHILADELPHIA, PA.

cently placed on the market Sodium Chloride Tablets for the prevention of heat sickness and also a modern plastic



Sodium Chloride Tablet Dispenser

dispenser. The tablets are compressed of pure sodium chloride. They are small, easily swallowed without any salt taste. The tablets can be placed in the plastic dispenser which can be located near a drinking fountain. This provides a convenient and satisfactory means of supplying workmen one tablet at a time. A total of four to six tablets during a work period is usually sufficient to maintain a proper salt balance in the body.

Du Pont Chrome Refinishing Kit

A new method for removing rust from chrome plated metals and protecting the chrome so that it stays bright and shiny has been made available by E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware. The new development will be marketed in the form of "Chrome Refinishing Kit" which contains a tube of specially formulated paste cleaner, a can of protective lacquer and a brush for applying the lacquer.

The lacquer is a clear, methacrylate product which is said to dry in 15 minutes, forming an invisible film over the surface. The lacquer may also be used for protecting brass, bronze, nickel and copper when these metals are subject to rust and tarnish. Particularly designed for chrome auto parts, the lacquer of the Chrome Refinishing Kit is also recommended for building hardware, bronze name plates, trophies, bank fixtures and metal objects which are exposed to weathering.

The cleaning agent of the Du Pont Chrome Refinishing Kit is primarily for automotive chrome and is used preparatory to applying the lacquer. Other metals may be polished with milder metal or silver polishes before the lacquer is applied. A recommendation is made for rubbing the polished metal with naphtha or tri-clene.

Paasche Flock-Reclaiming and Adhesive-Coating Booth

Paasche Airbrush Co., 1910 Diversey Parkway, Chicago, Ill., has placed on the market a Combination Flock-Reclaiming and Adhesive-Coating Booth designated as the "Type F873". The binder is applied in the right section of the booth

If you have a finishing problem of unusual difficulty.

If you are interested in checking your present schedule for economy.

If you are merely curious as to what we have to offer

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and the flock is applied and reclaimed in the left section. The booths are made of 22 gauge steel panels electrically welded to a heavy angle iron frame which aids in the elimination of material accumulation and admits a maximum of light. These booths have a maximum of working space and are said to be easily cleaned.

Paasche Flock-Reclaiming and Adhesive-Coating Booth

The Air-distributing Plates of the booth are readily removable and provide a uniform flow of air throughout both sections. To prevent any possibility of sprayed flock scattering around the finishing room, a special removable curtain at the front of the flock section is provided. A Collector Screen at the back of the flock-reclaiming section rests on expanded metal. Excess flock drops at once from the Collector Screen into the Flock Collector Pan located at the bottom, where it may be readily reclaimed for reuse.

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S. P. I. A. 23 Rue du Renard PARIS, FRANCE

Casil Dermo Hand Coating

A hand coating for protecting skin against acids, oils, pigments, and so on, to be known as "Casil," has been placed on the market by Dermo Company, 178 Wacker Drive, Chicago, Illinois. Casil is a semi-liquid material which is rubbed onto the skin of the hands and arms and forms a protective film that prevents contact from materials which tend to irritate the skin. It is said to be suitable for use in handling acids, dyes, oils, pigments and protects against any material containing less than 2 per cent water. The coating resembles cold cream in consistency and appearance, is not sticky or gummy, and can be washed off by the application of water.

Midwest Hydraulic Portable Table

Heavy lifting, accidents, and damage to dies and tools have largely been avoided in the tool or die shop, stamping department or other parts of the plant by the use of the Midwest Hydraulic Portable Table, illustrated herewith. The table, which is a product of The Midwest Tool & Engineering Co., 112 Webster St., Dayton, Ohio, is designed to employ a compact, highly efficient hydraulic mechanism by which the table can be elevated or lowered to any desired height by a slight pressure of the foot leaving the operator's hands free at all times. In addition to serving as a means for conveying dies or tools from the bench to the machine, the table can be used as a portable bench or as a plate for laying out work. The plate which comprises the top is well ribbed and accurately machined, making a good surface plate.

Midwest Hydraulic Portable Table

The table is 24 by 30 in. and the dimension of the base is 26 by 31 inches. Carrying capacity of 2,000 pounds. The

SAWTOOTH CHROME ANODES
10 EDGES FOR THROWING POWER
EXTRUDED LEAD
3082 W. 106th ST.
HEIL & CO.
AT PLAIN ANODE PRICES
WRITE FOR NEW BULLETIN ON ANODES
CLEVELAND, OHIO

table can be elevated to a maxmum height from the floor of 46½ in. or lowered to a minimum height of 31 inches. Weight, 350 pounds.

Spencer "Speedy" Steel Type Holder and Steel Type

The illustration shows a type holder which has been placed on the market by S. M. Spencer Mfg. Co., 3 Cornhill, Boston, Mass. As the name implies, the tool is made for the speedy changing of figures or letters used for marking such products as hardware, name plates, machine parts, and so on. The holder itself is of fine tool steel, hardened and tempered. The main body is fitted with a spring clip on one side only, which presses into a groove in each type to hold it in position. The type can instantly be released by pressing a button on the end of the clip. No set screws are required. The type are held in perfect alignment.

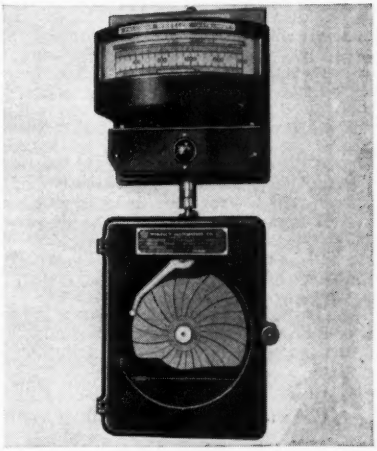
Spencer "Speedy" Steel Type Holder and Steel Type

The steel type made by this firm are of finest tool steel, with the character finely engraved in the exact center of the type body for perfect alignment. The type are also carefully hardened and tempered. Type is made in a variety of sizes, most of which is carried in stock for immediate shipment. Special sizes can be made up to order.

Wheelco Program Control

Wherever variable temperature control is required over any period of time, the Wheelco Program Control manufactured by Wheelco Instruments Co., 1933 S. Halsted St., Chicago, Ill., is said to offer unlimited possibilities. Any desired temperature program can be automatically carried through to completion without supervision.

The Program Control consists of a program unit and a Wheelco Controller mounted integrally. An idler arm which rides on the edge of the contoured disk of the program unit is attached to the temperature control setting pointer of the Wheelco Capacitrol. The program disk is rotated by a synchronous motor through a gear reduction.



Wheelco Program Control

The Capacitrol operation on the Wheelco "Radio Principle" controls the temperature of the furnace to any point set on the scale by the setting pointer; thus with the Program Control the temperature at which the Capacitrol controls is governed by the position of the idler arm on the program disk over any desired period of time.

The contoured disk can be cut to any time cycle desired with a variation of temperature control. The disk can be easily removed and replaced by other contoured disks to suit any required heating program.

Glyco Flexilac and Protoflex

A flexible shellac to be known as "Flexilac" has been placed on the market by Glyco Products Co., Inc., 148 Lafayette St., New York, N. Y. Flexilac is an orange colored non-inflammable,

METALPREP Metal Cleaners
Destroy the Rusters-Etch the Metal
Used First--Make Your Paint Finish Last
Make the metal safe for paint, provide a firm bond and insure a long life to finish coats.
No Fire Hazard Mix With Water
Non-Toxic Non-Injurious Non-Volatile
Write for Details
NEILSON CHEMICAL CO.
DETROIT, MICH. WINDSOR, ONT.

viscous resin which dries quickly to give a flexible, glossy adhesive film which is water soluble but is not affected by hydrocarbons. Because of this property, it may be used in cements for gaskets exposed to gasoline, naphtha, and so on. It may also be used in special adhesives, polishes, insulation, water-varnish and for the finishing of metals.

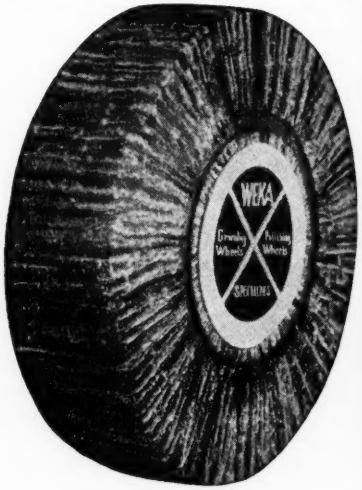
A flexible casein which is said to have the same properties and applications as Flexilac called Protoflex is a straw-colored transparent jelly which dissolves readily in water without the use of heat. This solution dries rapidly to give a flexible almost colorless transparent film. No alkalies or solvents are required. Protoflex is said to have a pleasant odor and will keep indefinitely without spoilage and is free from solid particles.

Hand Protecting Lotion

A lotion for protecting hands against chemicals, metal cleaning compounds, and so on has been placed on the market by American Solder & Flux Co., 4525 Wayne Ave., Philadelphia, Pennsylvania. The lotion is said to protect the hands and arms against attack and can be removed by washing with water.

Weka Metal Grinding and Polishing Wheels

Weigert & Spector, 35 Wooster St., New York, N. Y., has recently placed on the market grinding and polishing wheels designated as "Weka". The Weka wheels are said to be made of the most carefully selected grades of cotton, wool, and leather. The choice of the material of which the wheel is made depends upon the type of work which is to be ground or polished.



Weka Polishing Wheel

One of the outstanding features of the Weka wheels is said to be their composite construction which is said to eliminate burnt holes in the wheel. This avoids the necessity of grinding off bad spots caused by burning. Grinding and polishing compounds will adhere to the Weka wheels with a maximum tenacity. Each wheel is guaranteed to be properly balanced.

Hammond Single End Polishing Lathe

Hammond Machinery Builders, 1601 Douglas Ave., Kalamazoo, Mich., has announced the addition of a Single End Unit to the Rite-Speed Polishing and

For METAL FINISHING of every description CONSULT LUPOMATIC. Regardless of what your problem might be LUPOMATIC HAS THE SOLUTION FOR YOU.
Let us demonstrate to you how you can eliminate expensive hand polishing — improve the finish on your articles and bring about increased profits in your Finishing Dept. by tumble finishing in mass production.
LUPOMATIC TUMBLING MACHINE CO. INC.
4511 Bullard Ave. New York, N. Y.
Leaders in the field of tumble finishing

For a real good polishing job use
KEYSTONE EMERY
Write for Sample
KEYSTONE EMERY MILLS 4316 Paul St., Phila., Pa.

Buffing equipment line. The Single End Polishing Machine is said to be sturdily built and designed for heavy bulky work

Hammond Single End Polishing Lathe

and for one operator per machine.

The Single End Hammond Polishing Lathe is equipped with a chrome nickel spindle which runs in three ball bearings. A combination switch and brake enables the operator to shut off the motor and stop the revolving spindle instantly.

A spindle lock holds the spindle securely when changing wheels. An automatic motor starter with overload and low voltage protection is included. A motor and base is provided up to 10 H.P. capacity with multi-"V" belt drive.

Haveg Cold Setting Acid Resistant Cement

A Cold Setting Acid Resistant Cement has been recently placed on the market by Haveg Corporation, Newark, Delaware. Haveg Cement is a mixture of a special type of phenolformaldehyde resin with fillers determined by the service for which the cement is intended. In its natural form, the cement is a pasty material.

To apply the cement, a predetermined amount of cement is mixed with a definite volume of an alcoholic sulphuric acid solution. Under the action of the sulphuric acid, a hardening takes place simultaneously throughout the entire mass of the cement. After setting of the cement, no further treatment of the surfaces is necessary. The chemical resistance, hardness and density of the cement are said to make it exceedingly useful for use under corrosive conditions.

Haveg Cement can be used for joining operations such as laying up acid resistant tile, brick linings, and so on. Two courses, with staggered joints, are recommended in all such cases. The joints should be made as thin as possible, preferably ⅛ in. or less, and the bricks or tile should be dry, clean, free from salts, and the joint surfaces should be unglazed.

Haveg Cement can also be used in making small or temporary repairs to Haveg equipment which may have been damaged by accident. It can be applied in connection with Haveg blocks or pads shaped by hand and cemented into or over the damaged part.

Haveg Cement can be used successfully in pointing applications where the apparatus can be made completely dry and free from salts before application.

There are two standard grades of

"INDIAN BRAND" TURKISH EMERY

. . . very prompt shipments on any size or quantity!

"INDIAN BRAND" grains cut cleaner, faster and longer because they are made only from select grades of ore—accurately graded and thoroughly cleaned.

"INDIAN BRAND" and NAXOS EMERY. "HECCO BRAND" AMERICAN EMERY.

Send for trial lot—FREE

INDIAN BRAND

THE HAMILTON EMERY & CORUNDUM CO.
CHESTER MASSACHUSETTS

Haveg Cement, the "regular" grade which employs pure finely ground silica as a filler, and the "special" grade which makes use of a carbonaceous filler.

The "regular" grade is said to have excellent resistance to acids, salts, weak bases, many solvents, chlorine and other chemicals. The "special" grade is designed specifically for use with hydrofluoric acid and related materials. It has approximately the same resistance as the "regular" grade to other substances.

DeVilbiss Type MBC Spray Gun

The DeVilbiss Company, 300 Phillips Ave., Toledo, Ohio, has placed on the market a special model of the heavy duty Type MBC Spray Gun which is said to be designed and constructed to meet the need for a spray gun with a high degree of resistance to the abrasive action of porcelain and ceramic materials.

The Type MBC Spray Gun incorporates strong wearing parts and materials which are said to increase the life of the gun, assure efficient performance at all times, eliminate production delays caused by gun failures, and reduce rejected finished parts.

DeVilbiss Type MBC Spray Gun

The gun body is finished in natural Alumilite, thus giving it a hard, wear resistant, aluminum colored surface. The gun hook provided is easily removable so that it can be replaced when worn or damaged. The trigger pivot screwhole bushings and reinforcements inserted in the trigger at the contact point of the needle are made of specially hardened steel.

Inserts used in the orifice of the fluid tips, and points of the fluid needles are made of Carboloy, a material which insures extremely long wear.

Trent Three-Blade Electric Heating Element

An electric three-blade element for immersion use has been placed on the market by Harold E. Trent Co., 5402 Poplar St., Philadelphia, Pennsylvania. The base of the Trent heating unit is rectangular. A metal terminal cap is provided and the heated length measures 11 inches.

The rectangular upper housing of the Trent heating unit is mounted on edge rather than flat and the assembly includes a mounting plate rectangular in shape.

A. O. C. Respirator

The development of a new type respirator which will, according to the manufacturer, prevent silicosis, has just been

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Genuinely Friendly
In CLEVELAND it's
√ The HOLLENDEN
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In AKRON it's
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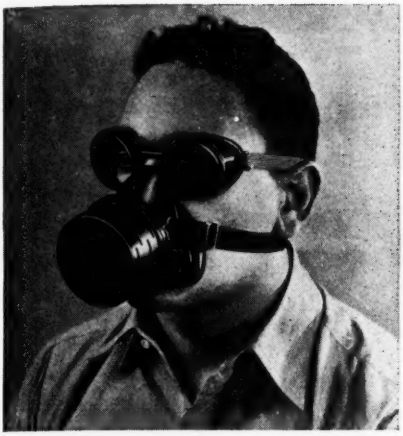
In TOLEDO it's
√ The NEW SECOR
In JAMESTOWN, N. Y., it's
√ The Jamestown and
√ The SAMUELS



A.O.C. Respirator

announced by the laboratories of the American Optical Company, Southbridge, Massachusetts. Silicosis is the incurable lung disease caused by breathing silica dust and the A. O. C. Respirator was developed expressly for industrial workers exposed to the silica dust hazard.

According to the announcement, the respirator is the result of extensive experiments and is said to be very highly efficient. It is designed to provide maximum comfort to workers. The A. O. C. Respirator has met with the approval of the U. S. Bureau of Mines.

The A. O. C. Respirator is compact, light in weight and permits unobstructed vision. An improved valve arrangement permits easy inhalation and exhalation. The valves are easy to keep in efficient working order.

Aluminum Sparkle Rip-pl

A metallic glistening of attractive wave line Rip-pl in varying degrees, has been made available by the Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, New York. The metallic appearance may be varied by increasing or decreasing the quantity of the aluminum powder used per gallon.

The Aluminum Sparkle Rip-pl may be used on any non-porous surface. It is well suited for heating and air conditioning equipment, toys, novelties, and so on. The finish is proof against alcohol and grease. It is moisture and oil resistant.

The distinctive metallic sparkle is discernible to a marked degree when light is reflected by it. In such cases, the addition of aluminum tends to lighten the color. All colors of Aluminum Sparkle Rip-pl can be baked at 200 deg. F. for one and one-half hours.

Fiberglass Anode Bag

An anode bag, to be known as "Fiberglass," for use in acid plating solutions has been placed on the market by Owens-Illinois Glass Co., 537 Ohio Bank Bldg., Toledo, Ohio. Fiberglass cloth and yarn are used in the body and draw string of the anode bag. The bottom seam is sewed with glass thread in order to keep construction of the bag completely inorganic.

The Fiberglass Anode Bag is said to be impervious to all acids except hydrofluoric. The finely drawn threads in the cloth provide excellent capillarity with a low voltage drop across the fabric. The bag is said to withhold the smallest suspended particles and can be cleaned for repeated use.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

for your CATALOG library

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. **Chemicals**

   The McGean Chemical Co., Cleveland, Ohio, has issued a 24-page catalog for users of chemical products containing a comprehensive list of the staple items manufactured and carried in stock.

2. **Alkali Cleaning Compounds**

   A new bulletin has been released by Detroit Rex Products Co., 13017 Hillview Ave., Detroit, Mich., describing Triad Alkali Cleaning Compounds.

3. **Safety Goggles**

   Complete Safety Catalog illustrating and describing every style and type of goggle for dusts, chipping, grinding, welding, polishing and acids. Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y. See Page 41.

4. **Dust Collecting Systems**

   An attractive 24-page catalog has just been issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, which illustrates and describes many K & B Dust collecting Applications installed in numerous industries. See Second Cover.

5. **Plating Barrel**

   The Udylite Plating Barrel is completely detailed in a bulletin published by the Udylite Company, 1651 E. Grand Blvd., Detroit, Mich. See Page 21.

6. **Spray Booths and Ovens**

   Newcomb-David Company, Inc., 5741 Russell St., Detroit, Mich., has issued a 24-page catalog illustrating and describing typical N-D Spray Booths, Industrial Ovens, Metal Parts Washers and Ventilating Equipment.

7. **Black Finish To Steel**

   A 4-page bulletin outlining the Pentrate Process of applying an attractive, low-cost black finish to steel, through a process of chemical action. Heatbath Corporation, Springfield, Mass. See Page 31.

8. **Metal Cleaning Hints**

   An interesting bulletin giving details on Metalprep Rust and Grease Remover. Tells how Metalprep makes metals safe for paint. Neilson Chemical Co., 6564 Benson St., Detroit, Mich. See Page 49.

9. **Industrial Ovens**

   Two new bulletins giving full particulars on air heaters and industrial ovens. J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y.

10. **Automatic Polishing Machines**

    The Packer Machine Co., Meriden, Conn., has issued a catalog illustrating and describing the Packer line of automatic polishing and buffing machines. See Page 45.

11. pH Test Paper
Hydrion Bulletin describing wide range pH test paper which gives five distinct color ranges in range pH 2 to pH 10. A generous supply of sample test papers is included. R. P. Cargille, 118 Liberty St., New York, N. Y.

12. Dust Control by Sly
This bulletin gives an extensive resume of cloth type filters, their application to many dust control problems, and general information concerning dust control equipment and installations. Advertising Department, The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland, Ohio.

13. Steam Specialties
Illustrated with 22 actual examples, this booklet outlines a practical method for judging how well steam specialty equipment is made to give long service without repairs. The International Nickel Company, Inc., 67 Wall St., New York, N. Y.

14. Automatic Grinding and Polishing Machine
A new bulletin giving full particulars on Excelsior Automatic High Speed Ball Bearing Twin Spindle Electric Sole Plating Grinding and Polishing Machines. Excelsior Tool & Machine Company, Ridge Ave., East St. Louis, Ill.

15. Burnishing Barrels
Complete details on the Abbott burnishing barrels and burnishing materials are contained in a folder brought out by Abbott Ball Company, 1061 New Britain Ave., Hartford, Conn.

16. Protective and Decorative Finishes
Hilo Varnish Corporation, 42-60 Stewart Ave., Brooklyn, N. Y., presents Bulletin No. 15 titled, "The Five Hilo Rip-pls".

17. Portable pH Meters
Bulletin M-361A describing Thwing-Albert Instrument Portable pH Meters which are built to fill the everyday practical requirements in laboratories and industrial plants. Thwing-Albert Instrument Company, 3339 Lancaster Ave., Philadelphia, Pa.

18. Rust-Proofing Methods
New books describing the Parker Processes are available to manufacturers and technical men. For more than 22 years the Parker Rust-Proof Company, 2172 E. Milwaukee Ave., Detroit, Michigan, has devoted its entire time to rust-proofing methods.

19. Abrasive Bond
An 8-page folder describing Nuglu for setting up polishing wheels and belts. J. J. Siefen Company, 1936 W. Lafayette Blvd., Detroit, Mich.

20. Canopy Localites
This catalog describes lighting units from small canopies of only 20 in. length up to models 36 in. wide in continuous runs of any length. There are units for bench and table mounting, models for overhead suspension, a new deluxe desk model, and a portable unit on a 50 in. upright. The Fostoria Pressed Steel Corporation, Fostoria, Ohio.

Print plainly in filling out coupon for literature.

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431 Main St., Cincinnati, Ohio

I am interested in receiving the following literature reviewed in your September issue.

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Products Finishing

CLEANING

PLATING

POLISHING

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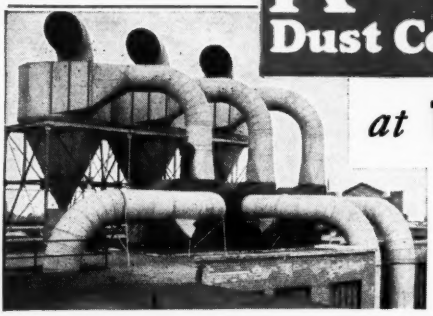
SEPTEMBER • • 1938

KIRK & BLUM
Dust Collecting Systems

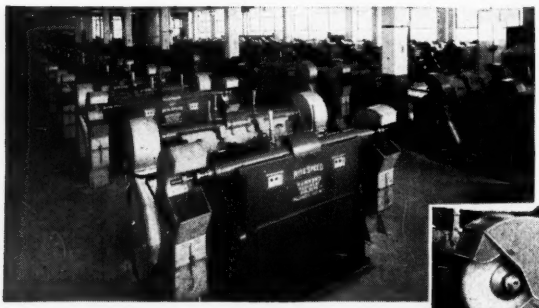


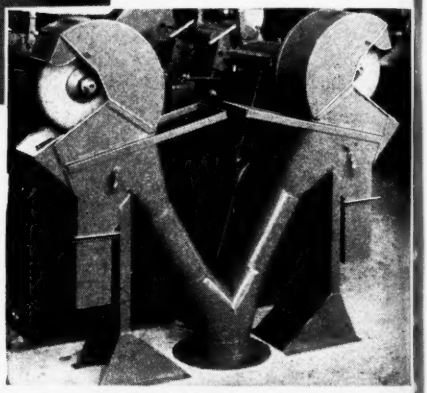
Giant K & B "Cyclones" at Trico Products, Buffalo, N. Y.

at TRICO PRODUCTS CORP.

IN 1929, Trico Products Corporation, Buffalo, N. Y., manufacturers of windshield wipers, selected Kirk & Blum to design and install a dust collecting system in the new buffing and polishing department. Since then, as Trico's business and program for a cleaner, healthier plant expanded, additional systems have been installed.

If you, too, have a dust collecting problem, why not let our engineers help you solve it. Without any obligation, interesting, valuable information will be mailed on request.





A complete K & B System for 93 additional lathes (above) was a recent repeat order. Seven separate systems, serving 148 lathes and handling 225,000 C.F.M., now keep the Polishing and Buffing Departments clean.

(Right)—A close-up view showing installation of K & B hoods and piping on buffing and polishing lathes at Trico.

Send for New Illustrated Book: "Dust Collecting Systems in Metal Industries"

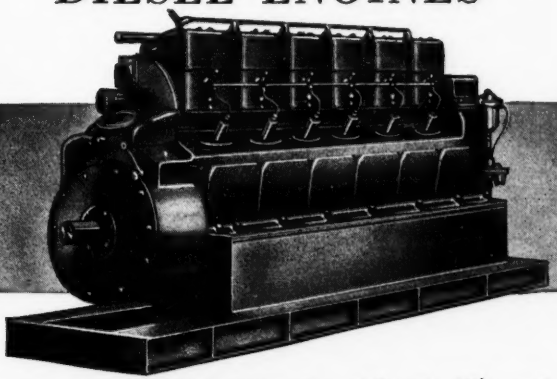
THE KIRK & BLUM MFG. CO. 2816 Spring Grove Ave., Cincinnati, Ohio

Designers and Builders of Dust Collecting, Fume Removal, Ventilating Systems — Industrial Ovens — Pickling and Plating Equipment, Etc.

Chicago Representative: C. P. Gulon, 1601 No. Milwaukee.
Pittsburgh: Bushnell Mchy. Co., 911 Ross Street.
Louisville: Liberty Eng. & Mfg. Co., Inc., 1482 S. 15th St.

20 *out of* 36*

LEADING MAKERS of DIESEL ENGINES



..... *use* OAKITE *Certified Cleaning*

Engineering and manufacturing skill of a high order characterize the making of today's Diesel engine.

In connection with the production of various types of Diesel (and semi-Diesel) power units, it is significant that 20 out of the 36* leading concerns rated AAAA in Thomas' Register rely on scientifically designed Oakite cleaning materials for various production operations mainly because they consistently produce the required results the year 'round on a low-cost basis.

For wet grinding, for removing oil, grease, dirt, etc., from castings, for cleaning aluminum parts, cleaning before plating, cleaning before painting, and in connection with the servicing and maintenance of Diesel units, Oakite materials are important factors in the production schedule.

It Pays to Change Over To Oakite!

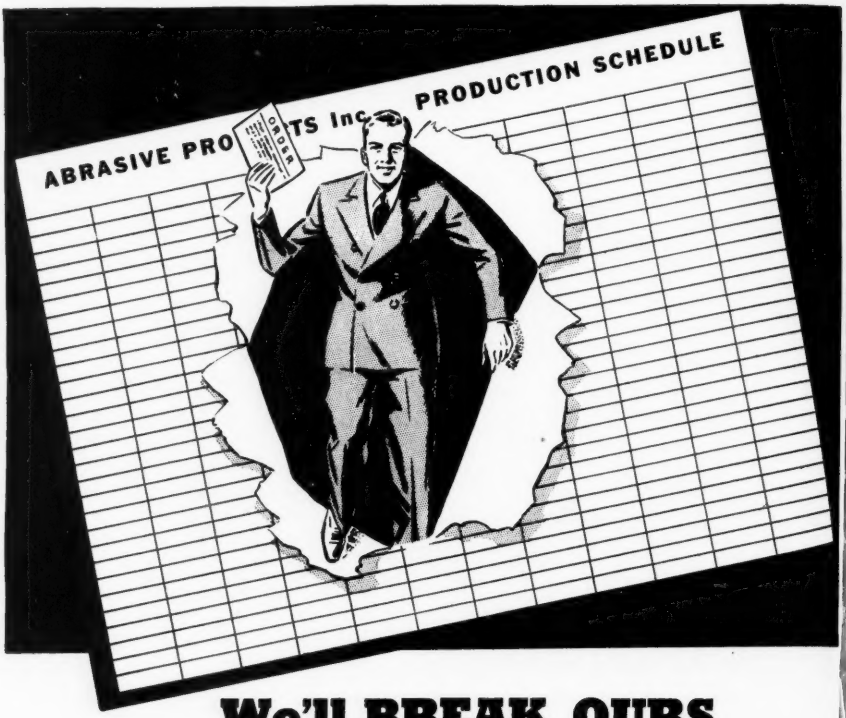
Whether for any of the production operations just mentioned, or for cleaning water jackets and circulating systems of Diesels, you will find that changing over to Oakite Certified Cleaning brings worthwhile advantages to your plant. Write . . . let us prove this to you.

Manufactured only by

OAKITE PRODUCTS, INC., 20 Thames St., NEW YORK

Branch Offices and Representatives in All Principal Cities of the U. S.

OAKITE MATERIALS & METHODS *Certified* **CLEANING** FOR EVERY CLEANING REQUIREMENT



We'll BREAK OURS So You Won't Have To Break Yours

Your production schedule has to be *rigid* . . . and many times its maintenance may depend upon the right coated abrasives at the right time! That's why our production schedule is *flexible* . . . to give you the 48-hour action on special orders that's making the name "Jewel" stand for *results.*

So next time you need a special shape or size of abrasive sheet or belt to keep some important machine from knocking off before the whistle blows, don't wring your hands and wish you had ten days or two weeks. Write or wire AP for 48-hour action and keep your production schedule unbroken! Abrasive Products, Inc., 507 Pearl Street, South Braintree, Massachusetts.

Real Technical Help

When you want a good answer to an efficiency or economy problem in abrasives, refer it to Abrasive Products' engineers. You'll get co-operation; with the eagerness of a young, fast-growing manufacturer—with the knowledge of a group of men whose average experience in abrasives is over 25 years.

ABRASIVE PRODUCTS INC.

JEWELOX • JEWEL EMERY • JEWEL GARNET JEWELITE • JEWEL FLINT • NEW PROCESS

Higher Grade Rotary Files at LOWER TOOL-DOLLAR COST !!!

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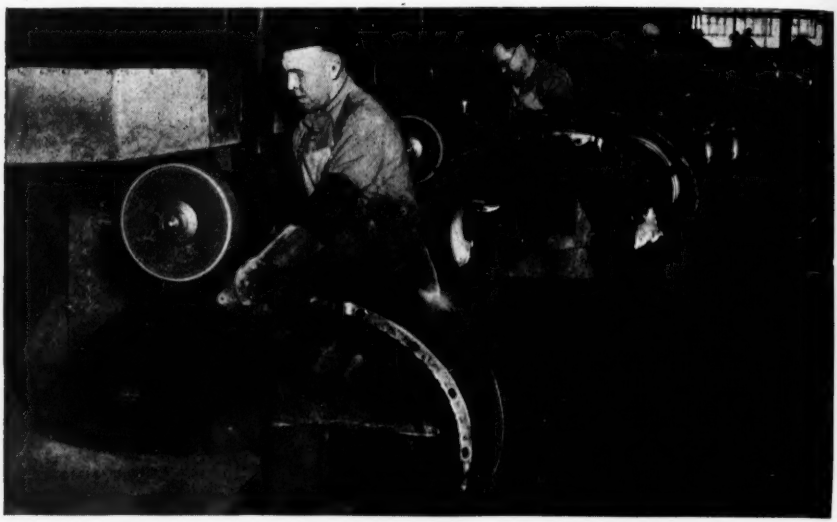
-of course

FORD HAND CUT ROTARY FILES PAY ON EVERY JOB

Catalog on request.

M. A. FORD MFG. CO.
417 Pershing Ave.
Davenport, Iowa



Fender Polishing...

Another Job that Needs the Features of Alundum Abrasive

FINISH is important on fenders—imperfections from the stamping operation and from handling must be carefully removed or they will be made more noticeable by the enameling.

NORTON COMPANY
WORCESTER, MASS.

Because Alundum Abrasive gives the desired finish and does it quickly, many automobile plants are finding it the most economical grain that they can use. Special Norton manufacturing processes assure: (1) uniform size, (2) strong shape, (3) high capillarity—three features that contribute greatly to the popularity of Alundum Abrasive.

G-51A

NORTON ABRASIVES

THE METAL SHOW ISSUE

A Real Advertising Buy!

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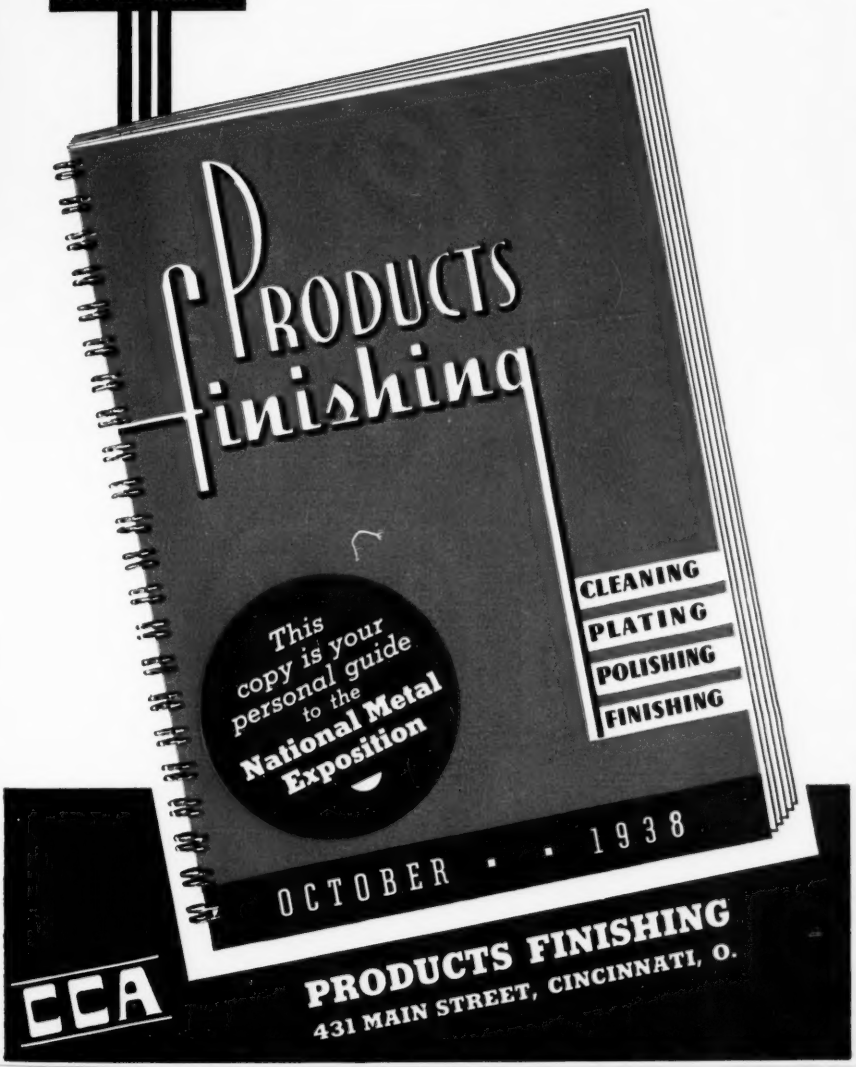
PLATING
POLISHING
FINISHING

• The October **PRODUCTS FINISHING** will feature the National Metal Show in Detroit — October 17-21. Over 16,000 circulation...5,000 Souvenir Copies printed on heavy enamel coated stock and Wire-O bound...personal copies presented to executives attending the show. Here's the ideal tie-up with the year's biggest metal fabricating and finishing show. **RESERVE SPACE NOW!**



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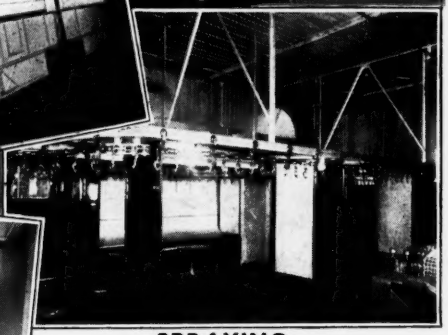
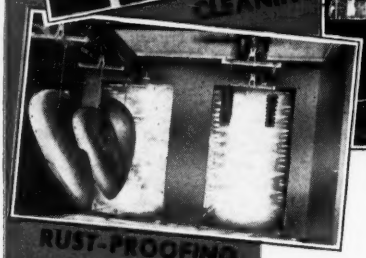
Complete FINISHING Systems

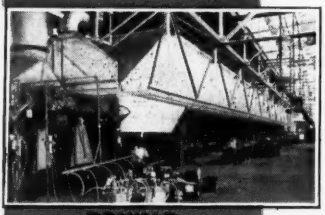
CLEANING



SPRAYING



RUST-PROOFING



DRYING

The illustrations above show units of Finishing Equipment designed by Mahon engineers and closely coordinated with other units to meet the manufacturers individual requirements.

Designed and Coordinated to do YOUR job perfectly.

Finishing Systems today are more than just a series of cleaning, rust-proofing, painting, and drying units; to insure satisfactory results, the entire system must be laid out by engineers who have studied the production problem involved, and who are thoroughly competent to design and closely coordinate an installation which will function efficiently. No two installations are alike . . . each requires specialized engineering—and for this type of engineering there is no substitute for experience. It will pay you to consult Mahon engineers before selecting equipment which so vitally affects production in your plant . . . Write today — consultation will not place you under any obligation.

THE R. C. MAHON COMPANY

DETROIT — CHICAGO

Designers and manufacturers of Metal Parts Washers, Rust-Proofing Machines, Hydro-Filter Spray Booths, Drying and Enameling Ovens, and many other Units of Special Production Equipment.

MAHON